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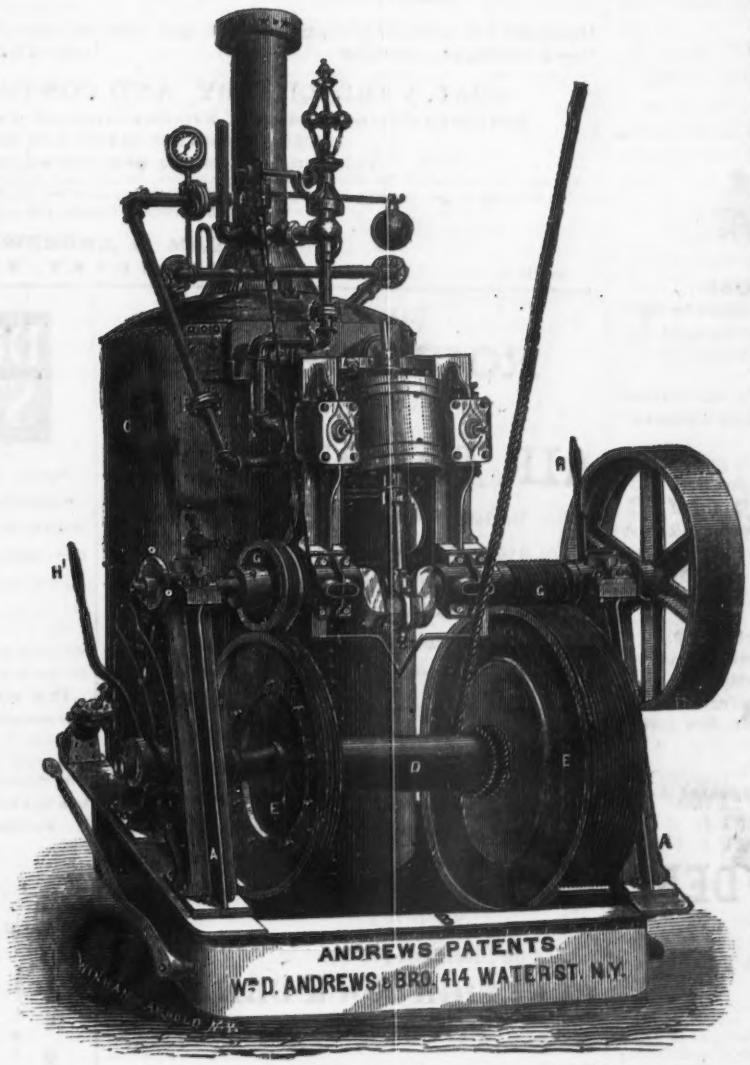
Friction Hoisting Machines.

IN noticing the machines exhibited at the American Institute Fair, we spoke of Andrews Friction Hoisting Machine, and this week give an illustration of it. It consists of an upright tubular boiler, and the machinery is of the oscillating type, which the Messrs. ANDREWS have adopted and applied with such success in all their forms of motion. The piston rod moves a crank shaft which has cut in it a number of V shaped grooves. These engage the grooves of two large drums which form the ends of the winding pulley. The power is in this way greatly multiplied while the friction mode of gearing not only relieves the ear from the disagreeable noises which accompany the work of cogwheels under heavy loads, but also relieves the machine from the constantly recurring shocks and consequent loss of power which are the defect of most cog-gearing.

The two grooved drums are not used together. One, for heavy loads, is geared to make one revolution with 7½ revolutions of the crank shaft. The other, for light loads, makes one revolution for 3¼ turns of the crank shaft; the hoisting speed can therefore be instantly adapted to the load to be raised.

Messrs. W. D. ANDREWS & Bro., 414 Water street, New York, are the makers.



ANDREW'S FRICTION HOISTING MACHINE.

The American Institute of Mining Engineers.

PITTSBURGH MEETING.

THIRD SESSION, THURSDAY AFTERNOON, OCTOBER 17, 1872.

Continued from Page 323.

The following paper was presented (the author, Mr. JOHN A. CHURCH of New York, being absent), on

COKING UNDER PRESSURE.

At the last meeting of the Institute, a discussion arose upon the question, Is there pressure in Coke ovens? and many of the members seemed to think that the superiority of the Belgian furnace might be due to the fact that it is a completely closed chamber in which the gases given off by the coal are, or may be, at more than the atmospheric pressure. It seems to me that this position is untenable and that an examination of one of these ovens in operation will show, not only that there is no excess of pressure in the coke chamber, but that the contrary is true, and a partial vacuum exists.

The Belgian or François oven consists of a rectangular chamber closed at the ends by sliding doors, and furnished with flues in the side walls and floor. The new charge is introduced at a time when the furnace is so hot as to cause immediate and copious discharge of the volatile constituents of the coal. The gases pass downwards through the side flues giving out their heat to the walls and thus to the coal. Underneath the floor air is introduced and the gases burn, producing intense heat. Heat is also reflected from the arched roof upon the coal which is therefore heated from all sides. The especial advantage which this construction was designed to secure is that no air is admitted to the coke chamber. All the heat is produced by the combustion of the uncokeable gases and the yield ought to be a *maximum*. It is so in fact, allowing for the imperfections inseparable from furnace construction and management. Sometimes the yield is in excess of the percentage indicated by assay, showing that the operations in the large way are more thorough than in assays performed upon comparatively minute quantities.

The sliding doors of course form no perfect joints, and to prevent the access of air the crevice around the door is closed by a clay luting. Except when the clay is of unusual excellence the luting cracks and sometimes scales off in places. It is evident that if there is excess of pressure in the furnace the gas will issue from these crevices, however minute, and will burn when it meets the air. With a pressure in the coke chamber we ought to see the oven doors fringed with small flames.

On the other hand, if there is a partial vacuum in the chamber the air will enter, the gases will burn, and there will be flames within the furnace. The coke will also burn and will leave proof of its combustion in the form of ashes.

Which of these conditions does observation point to as the one really existing? Evidently the latter. No flames appear around the door, but when the coke is drawn out the ends of the mass are found to be covered with ashes—proof conclusive of the entrance of air, and the existence of a lower pressure within the furnace than without. I have seen ovens luted with a short clay that cracked easily and required frequent renewal during the operation. In these there was an amount of ash which indicated a serious loss of coke, and whoever has the management of coke ovens will find that the selection of a proper clay for luting is well worth his attention.

These circumstances seem to me to sufficiently disprove the supposition of those who look to pressure of gas as a cause of the excellence of the coke from the Belgian oven. It is possible, however, that pressure does exist for a short time after the furnace has recovered from the temperature lost upon the first admission of the moist and cold charge, and while the coal is still rich in hydrocarbons. It is possible that for a short time the evolution of gas is greater than the capacity of the flues to carry off, but this cannot last very long, nor be very marked, and it is doubtful if it has any effect whatever upon the formation of the coke. I am the more inclined to this opinion for the reason that progress in the construction of coke ovens has not taken the direction of increasing or maintaining this pressure if it exists. It does not appear that any attention has been paid to it. Dating from the time when the great step of excluding the air from the coking chamber was taken, improvement has followed two lines. They are:

1. To increase the height of the bed of coal.
2. To increase the temperature at which it is coked.

Recent changes illustrate the character of this improvement in a striking manner. Instead of broad and low chambers, narrow and high ones have been built. Formerly the coal lay in a thin horizontal layer; now it is a thin vertical layer. The thickness of the interior walls, which transmit the heat to the

coal, has been lessened nearly 60 per cent. in one instance. The time of coking has been reduced to 24 and 36 hours. Twenty-four hours is a length of time which seems to meet with general favor, both from the convenience of management, and also from its effect upon the result.

A greater pressure, due to height of the mass, and therefore a denser coke, has been the result of the change in form; while a higher heat is obtained from the use of thinner walls, and from making the charge while the furnace is still at the high temperature produced by the combustion of rich gases. Both causes permit the use of a poorer coal, whether its poverty results from the presence of ash, or from lack of volatile constituents.

The Belgian oven produces a coke that seems to be about as near perfection as we can expect to obtain. It is large in fracture, finely gray in color, firm and ringing. It contains a minimum of volatile matter, and, strange to say, the very thoroughness of the coking process in this furnace has caused its rejection in at least one instance. Mr. I. LOWTHIAN BELL mentions that his firm returned to the old form of oven—probably the Beehive—after trying the Belgian. The reason was, that the latter furnace made too hard a coke, and more fuel was necessary in the blast furnace. Mr. BELL'S view of the case seems to be that the hard coke resisted solution by the carbonic acid formed lower down in the furnace. This produced a lack of carbonic oxide which is necessary for the deoxidation of the ore. Thus the train of operations upon which iron-making depends was interrupted. But these effects are, of course, dependent upon the furnace and charge employed. It is very possible that the change from a soft to a very hard coke will throw the usual run of a furnace into disorder, but this is nothing against the positive value of hard coke, which certainly cannot be more difficult to handle than anthracite coal.

The gradual improvement of coking processes has enabled us to increase the thickness of the coal in the oven from 18 inches to four feet, or a little less.

The building of a hundred new ovens in a Westphalian establishment, side by side with those which have been in use for years, enables us to observe the changes that experience dictates. We find that for the same charge of coal the length of the furnace remains unchanged, while the width has been reduced 45 per cent., the thickness of the interior walls 54 per cent., and the time of treatment from 25 to 33 per cent. The only dimension that has been increased is height, 30 per cent. having been added to the height of the chamber, and 88 per cent. to that of the coal. The dimensions of the two setts of furnaces are:

	Old ovens.	New ovens.
Length,	22 ft.	22 ft.
Width,	2 ft. 7 in.	1 ft. 4½ in.
Height,	5 ft.	6 ft. 6 in.
Charges,	4 tons.	4 tons.
Time,	36—48 hours.	24—36 hours.
Surface of floor,	57 sq. ft.	36 sq. ft.
Thickness of inner walls,	29 in.	13¼ in.
Yield,	65—72 per cent.	

The object of these changes was not to increase the yield; that was already satisfactory. But it was desired to use a dryer coal, or a mixture which would not produce a good coke in the old furnaces.

Having glanced at the changes which have met with approval, it is worth while to mention those which did not prove to be entirely advantageous. We find that in the early days of the Belgian oven it was sometimes made as much as two metres, or nearly seven feet high, and also that very large ovens were built, to take a charge of as much as seven or nine tons. Neither of these forms has met with entire approval. A bed of coal 40 to 50 inches in thickness has been found to give sufficient solidity to the coke, and the use of thinner walls with a moderate height of chamber permits a sufficiently large product from a given area of ground. Thus 100 ovens of the dimensions given above will cover, old style, about 11,000 square feet, and new style about 5,500 square feet, or just one-half. The average time of coking was in the old ovens, 42 hours; the charge four tons; and the product from 11,000 square feet in twenty-four hours was therefore the coke from about 230 tons of coal. By the new method of construction, the charge being the same and the time thirty hours on an average, the product from 11,000 square feet will be the coke from 620 tons of coal, or nearly three times as much. Inasmuch as the very large furnaces take an exceptionally long time to do their work, it is plain that the smaller ones fully equal them in the amount of their product.

Mr. W. FIRMSTONE: I was recently reading, in a French work, a note on the manufacture of coke, in which the author says that if the flues are too small, a mixture of gas and air is liable to be formed, giving rise to troublesome explosions.

Prof. COX: In 1856 I made a series of experiments upon coals of the West, the records of which I have unfortunately lost. I was not investigating the subject of coke; but in one of the experiments I placed coal in an iron retort, to which were attached various pieces of apparatus. I was not attempting to produce a pressure in the retort; but there must have been more or less pressure, owing to the amount of apparatus traversed by the gas. And I remember that, under these conditions, both the amount and the physical cohesion of the coke were increased over what was obtained in the ordinary way from the same coal.

Mr. J. J. ENDRES, of Pittsburgh, Pa., then read a paper on

COAL-WASHING AND COKE OVENS.

This paper will be published in full in our columns hereafter. After the reading of the paper remarks were made by many members.

Mr. PECHIN: I happened to be at Alpsville at the time Mr. ENDRES was experimenting on the different coals. I called his attention to several little points which I noticed. The quantity of slate and pyrites which were separated by that washing-machine was simply wonderful. It was incredible what a mass of stuff they had been trying to make iron of, in using that crude coal. But another curious result was obtained there. A lot of coal had come in from Johnstown. (I suppose a good many gentlemen here have seen the coke that used to be made at Johnstown; it was great heaps of soft stuff that you could kick to pieces with your foot.) Mr. ENDRES had washed that coal, and extracted a considerable quantity of slate and pyrites. He put it in the ordinary bee-hive ovens, and I saw it after it had been in 48 hours, and the ovens had not made any impression on the coal, showing conclusively that the bee-hive oven was not fit to coke the Johnstown coal.

Mr. ENDRES: They never succeeded in coking that coal in the old-fashioned ovens, nor can you make coke of the Illinois coal in those bee-hive ovens.

Mr. PECHIN: There is a point to which this is all preliminary. As we see plainly here, those coals that cannot be coked in the bee-hive ovens at all, can be coked with great success in these new-style ovens. Now, I would like to bring forward the question whether or not these Belgian ovens cannot be modified so as to be used in the West. I suppose there are gentlemen here who can answer that question. It is really a most important one.

Mr. ENDRES: There are five different varieties of coal in Illinois. I have seen the Bellville and Danville and some others. I am sure some of them will make a very nice coke. I would not promise much from the Bellville and Danville coal, but I know from the quality of other coals that they will do well. I saw some coal sent here from Kentucky, which is very bright and hard.

Mr. ALEXANDER: There is a new deposit of very pure bituminous coal discovered in Fountain County, Indiana, at a point thus far not reached by the railroad. A Mr. JOLIET has secured a lot of that coal territory, and it is now being opened up; and I have no doubt he will thoroughly test it for coke purposes. It is pronounced, by persons competent to judge, to be the very best coke material west of the Alleghany Mountains.

Mr. MILLER, of Pittsburgh.—I understand that a Scotchman has taken out two patents for coking block coal.

Mr. ENDRES.—It is only a question of difference in the height, and not in the shape of the ovens. I would just state that I have never claimed any patents on my ovens. It is my legitimate business, and I was not entitled to any patents because I was employed by the Government of Prussia to make the experiments on which my system is founded.

Mr. COXE.—The block coal of Indiana in burning, retains its shape, its illuminating properties, and its mineral appearance. It burns like a log of wood, never coking until it is burned to a white ash. Another kind is the cannel coal. It retains its shape and burns like a candle. They have not been successful yet in making a good coke from it. We use it at present in its raw state. We do not feel the necessity of coking that coal, but we should like to coke the slack that comes from it. I feel deeply interested in this matter, having been engaged for the last twenty years in visiting coal veins throughout the West. I know that if this machine will make coke out of that coal, it will work a revolution and be brought into general use. The block coal of Indiana extends to the Eastern margin of the basin, and half a mile from where the coal is block coal, you come on to bituminous coals. These coals contain bituminous matter in large proportion, and there is no difficulty whatever in making coke; but there is great difficulty in making a good coke. What we want a washing machine to do, is to take the sulphur out. The Wilmington coal is very sulphurous, but it is far from what we call block coal. It is a coking coal, and when a man makes good coke out of that, he performs a great work.

(TO BE CONTINUED.)

Researches upon the Consumption of Heat in the Blast Furnace Process.

BY RICHARD AKERMAN.

Translated by FREDERIC PRIME, Professor of Metallurgy in Lafayette College, Easton, Pa.

CONTINUED FROM PAGE 194.

XVII. The heat lost by the use of water-tuyeres depends of course upon the amount of surface these expose to the interior of the furnace and must become as much greater as the tuyeres, having a certain thickness of metal, are broader and become more exposed by the burning out of the hearth. Prof. EGGERTZ* has determined, in respect to this loss of heat, that with a but slightly protruding water-tuyere, 2⅜ inches in interior diameter, the heat carried off per minute amounted to $1.586 \times 61.52 = 97.57$ cal. which corresponds in a tuyere having 2 1-12 inches interior diameter to 111 cal. Since the blast-furnace under discussion has two tuyeres and makes 1600 cwt. of pig iron weekly, the amount of heat consumed is at least $2 \times 111 \times 7 \times 24 \times 60 \div 16000 = 14$ cal. per lb. of pig iron made or of coal charged.

XVIII. So far as the author is aware, no experiments have been made in Sweden to determine the heat carried off by the tymp and forehearth. If, however, we regard the comparatively large cooling surface and the loss of heat which must take place when cleaning out the forehearth, it is probably not too high an assumption if the amount of heat lost be taken as 1½ times as great as that just mentioned in the case of the tuyeres, *i. e.* $1.5 \times 14 = 21$ cal. per lb. of fuel charged.†

* See *Jern-Kontoret's Annaler* for 1852, p. 12.

† The quantity of heat lost depends of course in great part on the size of the forehearth, but it seems to me that Mr. Akerman's assumption is much too small. Besides, instead of making this assumption, it would have been far better to have experimented in this direction, especially when no one had previously done so in Sweden.—F. P.

XIX. Neither have any researches been made with regard to the cooling effect produced by the remaining surfaces of the blast-furnace, which depends on the thickness of the walls and their power of conduction. BELL, however, has made experiments in this direction on a coke blast-furnace and has come to the conclusion that 55.4 per cent. of the heat which is necessary to fuse the pig iron is conducted off merely by the walls of the furnace. It is evident that in English furnaces of the latest type, with their walls, the loss of heat must be considerably greater than in the Swedish ones. But on the other hand, if we take into consideration the much greater production of the English furnaces and the circumstance that in the case now under consideration it depends not on the loss of heat per unit of time, but per weight-unit of pig iron produced, it would appear that the loss of heat in the English furnaces is comparable with that in the Swedish. As experiments are lacking on this point in Sweden, it may be assumed with due regard to BELL'S researches, that the cooling caused by the walls and bottom of a Swedish charcoal furnace, having exterior walls, inner and outer lining, is 30 per cent. of the heat necessary to fuse pig iron, *i. e.* $0.3 \times 310 = 93$ cal. per pound of fuel charged.

In order to obtain a clearer *resumé* of the different amounts of heat consumed and lost, they are here tabulated. There are consumed per weight-unit of charcoal charged

To fuse the pig iron	310.0 cal.
" " " slag	342.2 "
" reduce the silicon by carbon	15.0 "
" " " iron " "	301.6 "
" expel the carbonic acid from the charge	36.8 "
" " moisture from the charcoal	63.1 "
Heat carried off by the furnace gases	586.6 "
" " " " water cooling the tuyeres	14.0 "
" " " " cooling of the tymp and forehearth	21.0 "
" " " " sidewalls and bottom	93.0 "
Total quantity of heat used	1783.3 "

The total quantity of heat per lb. of fuel charged into the furnace, both by the combustion of the latter and that introduced from without, amounts, according to the previous calculations, to 1796.3 cal.; therefore only 3 cal. remain unaccounted for.

XX. Before passing to a more minute examination of the various processes of the blast furnace which consume heat, we shall endeavor, in order to avoid all misunderstanding, to show more clearly that in the conduction of the heat from the furnace by the hot furnace-gases, as previously stated, the great loss of heat from the imperfect combustion of these gases has been entirely neglected. Or, in other words, that a large portion of the escaping gases are still combustible and must therefore be regarded as fuel. This great loss of heat includes, per weight-unit of fuel charged into the furnace, all that heat which could be produced if the amounts of carbonic oxyd, marsh gas and hydrogen contained in the tunnel-head gases, corresponding to the above mentioned weight-unit, were completely burnt to carbonic acid and water. This loss of heat amounts to: $1.38227 \times 2403 + 0.00708 \times (8080 \times 12 \div 16 + 29638 \times 4 \div 16) + 0.00291 \times 29638 = 3321.6 + 95.3 + 86.2 = 3503.1$ cal. On the other hand the amount of heat which would be produced in the blast-furnace if the water carried in by the blast should leave the furnace in the same condition and all the combustible ingredients of the charcoal, with the single exception of the chemically combined carbon in the pig iron, were burnt to carbonic acid and water, is $0.82(1-0.5122) \times 8080 \times 0.01368 \times 2404 + 0.00291 \times 29638 + 0.00708 \times (8080 \times 12 \div 16 + 29638 \times 4 \div 16) = 6586.2 + 32.9 + 86.2 + 95.3 = 6500.6$* cal. Hence the amount of heat lost in the blast furnace by the imperfect combustion of the fuel is $6500.6 : 3509.1 = 100 : x$. $X = 53.9$ per cent. is the amount of heat lost, which could be gained by a perfect combustion.

Since a more perfect combustion can only be produced by the oxygen of the ores, it is very evident that the combustion will be more perfect the greater the burden of ore added to a given amount of coal. Hence it is clear that the iron-master should strive to improve the blast furnace process so far as possible both by diminishing the quantity of heat required in the blast-furnace, as well as by the addition of as cheap an extraneous heat as possible. It is, however, under any circumstances impossible to attain a perfect combustion of the fuel used, as among other conditions it is necessary that the carbonic oxyd occurring in the blast-furnace gases should, even to the last trace, exert a reducing action on the ores; this it is impossible for it to accomplish in the case of the peculiarly refractory ores of Sweden (magnetite and specular iron). The reason for this is due to the fact that precisely in the same manner as oxidised iron is reduced by carbonic oxyd with the formation of carbonic acid, so also iron is oxidised by carbonic acid with the formation of carbonic oxyd. Both of these reactions, due to the contact of a mixture of oxidised and metallic iron on the one hand with a mixture of carbonic oxyd and carbonic acid on the other, depend on the temperature which prevails as well as on the proportions in which the two gases exist in the mixture. BELL'S experiments have shown that a mixture of oxidised and metallic iron remain unchanged: at a dark red heat, if the mixture of the gases consists of 60 volumes carbonic acid to 40 volumes carbonic oxyd; also, at a high red heat, if the gas-mixture contains 32 volumes carbonic acid to 68 volumes carbonic oxyd; and at a white heat, if there are 10 volumes carbonic acid to 90 volumes carbonic oxyd. If, however, at the different temperatures, the carbonic oxyd is present in greater proportions, this excess then exerts a reducing action on the oxidised iron or ore; while if the carbonic acid exceeds the amounts mentioned it exerts an oxidising influence on the metallic iron. The reduction, or oxidation, continues until the neutral proportions mentioned as existing between carbonic oxyd and carbonic acid are attained. Hence it follows that the higher the temperature so much the less must the proportion of carbonic acid be in order that the gas mixture may exert a reducing action; and further, that the heating of the ores must take place as slowly as possible if a reduction should still be produced by gas-mixture relatively rich in carbonic acid and poor in carbonic oxyd. If, then, no reduction worth mentioning takes place at a temperature lower than a dark red heat, as seems to be the case in dense ores like magnetite, it is readily understood why—no matter how carefully the ores may have been heated or how slowly they may descend the furnace-shaft—the blast-furnace gases can no longer exert a reducing action beyond the point where the amount of carbonic acid becomes about 1½ times as great as the volume of carbonic oxyd.

Although the efforts of the ironmaster should always be directed towards oxidising the fuel charged as perfectly as possible, or in other words to attain as great a burden of ore as possible to a fixed amount of fuel; still, for the reasons given, it is never possible to attain this so fully, especially with ores which are so refractory as specular iron and magnetite, as to entirely utilize the fuel. It is, therefore, of great importance to pay sufficient attention to a corresponding utilization of the considerable heating power which the imperfectly oxidized tunnel-head gases possess under all circumstances. If all this heat finds a suitable use outside of the blast-furnace, which is impossible without a closed top, then the furnace acts as a great gas-generator, where even the heat produced by gasifying the fuel is utilized, which but rarely takes place in ordinary gas generators. And a portion, at least, of the pig iron produced appears, as it were, as a by-product, obtained without cost in the production of the gas.

For determining the possibilities by which the working of the furnace may be improved, through a diminished consumption of coal, or, where the quantity of this remains unchanged, through an increased burden of ore, it will be our endeavor to examine more minutely each of the causes of the consumption of heat, while the effect produced by the use of the hot-blast will also be considered.

XXI. The steam introduced into the furnace together with the blast is decomposed in contact with the glowing coals into hydrogen and oxygen, the latter of which at once unites with the coal to form carbonic oxyd. This causes a great loss of heat, which can be understood by a comparison of the calorific equivalents of the bodies concerned (per weight-unit of oxygen). These are:

For hydrogen by its combustion to water, $29638 \times 2 \div 16 = 3705$ cal.

For carbon by its consumption to carbonic oxyd, $2473 \times 12 \div 16 = 1855$ cal.

For each pound of oxygen, therefore, which passes in the formation of carbonic oxyd from the hydrogen to the carbon there are $3705 - 1855 \div 1850$ cal. consumed; and for every pound of water introduced by the blast into the furnace there are $1850 \times 16 \div 18 = 1644.4$ cal. rendered latent, in addition to which the amount of carbon consumed for this purpose (0.6667 lbs. for each pound of water) is lost.

It would be supposed that when the hydrogen thus set free came in contact with unreduced iron ores, it would be oxidised to water at the expense of the oxygen of the ores and thus the heat previously rendered latent by the decomposition of the water would again become active higher up in the shaft of the furnace. In such a case the water introduced by the blast into the furnace would, upon the whole, cause no loss of heat, but on the contrary would save a little, since a portion of the gas would be saved, which would otherwise have resulted from the production of the same action by carbon. But such an action does not seem to take place; since the gas analyses of RINMANN and FERNQUIST in Sweden, as well as those of others, have proved that the hydrogen once reduced in the blast-furnace is not again oxidised; or at least if it does undergo oxidation that it is instantly reduced again by the coal. Consequently it follows that the hydrogen in the furnace must be regarded as a neutral gas with respect to its reducing action and, like nitrogen, only robs the blast-furnace of heat without performing any corresponding work. It must also be borne in mind, as already remarked, that the hydrogen on being liberated (by its reduction from water), taking into account the heating power of the carbon thus used, robs the furnace of $29638 \times 2 \div 18 = 3293$ calories per lb. of steam blown in. From all of which it follows that the furnace should be supplied with air as dry as possible; hence the winter months exert a more favorable influence in this respect on the working of furnaces than the summer months, during which there is more moisture in the air. In this respect, however, it is remarkable that the working of blast-furnaces is not so sensitive to rainy weather, as many persons suppose.

* The difference between these figures and the heat produced in the blast-furnace (compare § 10) increased by the heat carried off by the still combustible portion of tunnel-head gases; *i. e.* $6500.6 - (1796.3 + 3509.1) = 1195.2$ cal., comes from that heat which has been produced during the reduction of the iron, silicon and hydrogen by the combustion of carbonic oxyd to carbonic acid and of carbon to carbonic oxyd. Since this heat is again consumed in the reduction mentioned, it should not be credited to either side.

[TO BE CONTINUED.]

That form of lamp which is known as the German Student Lamp is regarded with favor in all countries and whether sperm oil is burned in it, as was the case a few years ago, or olive oil as is the case in Italy, or refined petroleum, as in this country, the light is always mellow and clear. Its superiority lies in its construction and not in the fuel burned, and the employment of correct principles gives a lamp which always affords a steady and bright flame, just what the student needs.

The Manufacture of Iron and Steel.

By EDWARD REILLY, F.C.S.

(Concluded.)

Steel.

The time at my disposal will not permit me to enter fully into the composition of steel, and I purpose only considering some points of interest that have lately occupied my attention, more especially as to the occurrence of silicon in steel.

It has always been the general impression that any amount of silicon in steel reduces the quality and seriously impairs its strength. Mr. Snelus, in his paper on the condition of carbon in iron and steel, gives the analysis of brittle Bessemer steel containing silicon and compares it with the analysis of good steel, which contains only a very minute quantity; thus:

The former gave silicon ·640, the latter, .009
" " carbon ·550, " " .490

The former, a steel rail, was broken by a ton monkey falling from a height of 20 to 30 feet, whilst the latter was not broken.

Some time ago I was surprised to find in a sample of Mr. MUSHET'S so-called titanium steel a large percentage of silicon; the steel was undoubtedly of good quality, and in trying it practically it stood all the tests that are usually applied to good tool steel. The steel gave on analysis.

Carbon	1·283	1·286
Silicon	1·343	1·299
Sulphur	·074	
Phosphorus	·045	
Manganese	·480	
Iron	97·316	
	100·541	

No titanium could be detected.

The siliceous iron made from red ore, charcoal, and sand, was made partly with the object of using it for experiments to ascertain the influence of silicon on steel. Care was taken that all the materials used were as pure as possible.

A mixture of siliceous pig, Spiegeleisen, and shear steel was melted in a small clay pot in a Siemen's furnace. The mixture used consisted of—

Best Shear Steel	1lb.
Spiegeleisen	100 grms.
Siliceous iron	800 "

Great difficulty was experienced in melting it, as the clay crucible was enclosed in a larger black lead one; by exposing the clay crucible directly to the action of the gas the steel was melted and with some difficulty poured into a small cast-iron mould.

The steel worked well under the hammer, the edges being particularly sharp. It was drawn out to a bar about ¾ in. square and made into a tool. Unfortunately at the end it was not quite solid; however, by drawing out the other end, a small tool was made from it, and it was used for turning off the skin of cast-steel wheels, which is perhaps the most severe test a tool could be submitted to. It stood well, and the edge of the tool turned up slightly, showing that the steel was tough. The steel gave on analysis 2.07 per cent. of silicon.

I regret I am unable to give the Society any details as to the strength of such steel; it was my intention to have made further experiments on this point. It is, however, quite clear that good tool steel may contain over two per cent. of silicon; and from the trials made with the steels of which I have given the percentage of silicon and the analysis, I am not disposed to think that either of them is a weak steel; I believe them to be quite as strong as ordinary crucible cast-steel used for castings.

I have suggested the use of this siliceous alloy for the purpose of making steel castings more solid. The difficulty with steel castings is to get them perfectly solid. To attain this it is necessary to use a steel which contains a high percentage of carbon and which is consequently brittle.

Some steel wheels that had failed were sent to me for analysis, to see if there was anything in the steel that would account for their failing.

Analysis of Steel Wheels (cast.)

	I.	II.	III.
Carbon	1·233	1·237	1·203
Silicon	·297	·303	·427
Sulphur	·022	·017	·032
Phosphorus	·069	·069	·093
Iron	97·544	97·882	97·740
Manganese	·881	·955	·957
Copper	traces	—	—
	100·046	100·463	100·452

Ingot reported to be the same steel from which the wheels were cast—

	IV. Ingot steel.	V. Cast-Steel wheel.
Carbon	·435	·838
Silicon	·155	·216
Sulphur	·017	·037
Phosphorus	·131	·073
Iron	99·499	98·794
Manganese	·367	·453
Copper	traces	—
	100·604	100·411

The analyses given of the steel wheels I. and II. were from the teeth of wheels that had broken.

Analysis III. is a sample of steel from the same works from a pinion wheel.

Sample IV. was reported to be the same steel from which the wheels I. and II. were cast.

Sample V. is the analysis of a cast steel wheel from another steel works.

Steel castings have become now almost a necessity for certain parts of machinery where great strength is required, especially for spur, bevel, and pinion wheels.

The great difficulty with steel castings is to make the casting sound, the upper part generally being more or less honeycombed. To get sound castings, the melters introduce a certain amount of Spiegeleisen to make the steel more fluid. The consequence is that the carbon is made much higher and the wheels more brittle.

All steel castings are annealed, and their strength depends very much upon the care with which this is carried out.

Steel castings having the composition of I. II and III. require more careful annealing, and are more likely to break than sample V. although it is quite possible that steel wheels having the composition of I. II. and III. may stand well if very carefully annealed; the composition of sample No. V, is, however, very much better.

My impression is that for steel castings it would be advisable to increase the percentage of silicon, and to employ that element to make the steel even more fluid, and consequently obtain greater perfection in casting. I am about to carry out some experiments as to the effect of an admixture of siliceous iron to steel castings, to see to what extent their strength is reduced by adding silicon in various quantities.

Mr. NES, of York, Pennsylvania, has taken out a patent for making silicon steel. No details are however, given as to its characters and properties, further than that he uses siliceous magnetic oxide from Heidelberg, York County, Pennsylvania, to make it.

Chromium steel made in America has been tried in this country for a holing awl in a coal-cutting machine; it stood well, and generally the impression was favorable as to its quality. It is stated that the chromium partly or wholly replaces the carbon. In examining the steel I found chromium, although only in small quantity.

Chromium makes excessively hard alloys with iron. I have made alloys containing up to 20 and 30 per cent. of chromium. This alloy was much harder than steel, and dented it easily.

Mr. HENDERSON, an American in this country, is carrying out a series of experiments with fluor spar. He patents the use of this for puddling and refining iron by mixing it with various mixtures of iron ore, ilmenite, clay, etc. Samples of iron that have been treated by his process, made from pigs containing a higher percentage of phosphorus, I have found to be so free from it that the iron is adapted for making steel. The phosphorus I have found reduced to .06 per cent.

Some trials have been made in the Harz with fluor spar in puddling. It is said that a fibrous bar, not at all cold-short, is made from pig containing much phosphorus, and that such iron, when heated in the ordinary way, makes a cold-short iron.—*Journal of the Chem. Soc.*

A Blast Furnace Explosion.

The inhabitants of the ironmaking district around Coatbridge were thrown into a state of considerable excitement on Saturday morning by the report that a dreadful explosion had occurred at Carnbroe Ironworks, the property of the Merry and Cuninghame Company (Limited). It was shortly after six o'clock in the morning, and while both shifts had met to superintend the casting operations, that the catastrophe occurred. Along the whole line of furnaces the tap-holes had been opened, and the gleaming metal was pouring down the main channels into the rapidly filling beds, lighting up the dusky morning with a bright glare. The operations had so far proceeded with the usual success, when at No. 5 furnace a greater amount of flame than was necessary was issuing from the front. The attention of the furnace-keeper (William Ferguson) was at once drawn to the circumstance by William M'Callum, who volunteered to take Ferguson's place at the casting while the latter went round to inspect the tuyeres. When Ferguson arrived at the tuyeres, he found that one of them was leaking, but had scarcely time to do more than note the fact when the large iron plate immediately above the tap hole was blown out with terrific force, and a tremendous shower of red-hot coke was thrown over the men immediately in front of the furnace. M'Callum, who was standing at the main channel with a long skimmer in his hand, keeping the metal flowing freely into the beds, was at once knocked down and almost buried by the contents of the furnace, which were blown over the ground to a distance of fully one hundred yards, and to the depth of fully one foot. When the unfortunate man was reached by some of his companions all that was left of him was a charred skeleton. The other five men who were also struck by the shower managed to turn and fly, with their clothes in flames about them, but the shower continuing for some time they were all dreadfully burnt about the head and back.—[English paper.]

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The dues for the year ending May, 1873, are now payable. All members and Associates who have not paid their dues are requested to do so at once, by sending in postal orders, or checks, or money, ten dollars to the Secretary.

All members and Associates who pay their dues for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

II. It is expected that the more important papers read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

Wilkesbarre, Pa. MARTIN CORYELL, Secretary.

THE COAL TRADE.

NEW YORK, Nov. 22, 1872.

Business has suffered seriously from the spread of the horse disease throughout the coal regions, and would have been dull during the week were it not for the continued demand for house coals. The disease has been at its height, and many collieries have been forced into temporary suspension. The upper Lehigh Company, Carter's Colerain mine, nearly all the collieries in the Hazleton region, Mumpers and the Buck Mountain mines are among those which we have heard mentioned as idle from this cause. It was a question of considerable interest, whether the disease would penetrate the mines in those cases where the extraction was entirely by steam power, and there were no animals moving between the outer and the inner world, and this point is not decided so far as we have learned. Outside animals are all affected, or at least, the disease makes as clean a sweep as it has done in other districts, and wherever horses or mules were employed to haul the coal out, the inside animals of course stand in great danger. We intimated, last, week that mules and donkeys were less subject to attack than horses. That was said to be the experience in the Nothern States where the disease first appeared. But in the coal regions the opposite appears to be true. In the Cumberland district, for instance, the mules have suffered far more than the horses, and later accounts say, that the first impression in the North was wrong and that everywhere the decendents of the donkey, whether pure or hybrid have been especially liable to the complaint. However that may be, it is certain that coal mining is for the present almost laid on the shelf, in those mines which rely entirely upon animal power.

This is a fact of more importance that may be perceived at the first glance. Navigation is drawing to its close, and since the establishment of so many through lines of railroad that has usually been the signal for weakness in the market. So long as the canals remain open, their line trade absorbs a certain portion of the supply, which, when that trade ceases, is turned into the markets supplied by railroad. Whether the effect of the present partial suspension is great enough, under the peculiar circumstances of the year, to counterbalance the usual over supply, is a question with which a good many dealers have amused their leisure hours. Just how great the delay on the canals has been, may be seen from the following figures of amounts carried during this week in this year and last.

	1871 tons.	1872 tons.	DECREASE.
Schuylkill Canal	29,417	24,306	5,111
Lehigh Canal	22,691	12,666	10,025
Pa. Coal Co. Canal	239	—	239
Del. & Hud. Canal	40,625	6,678	33,947
	92,972	43,650	49,322

The falling off on these four canals amounts to more than half their business for the previous week. For the two weeks preceding this, they have carried 94,422 and 72,535 tons, the tonnage having, in fact, been decreasing from a month back, when it stood at 106,515 tons. The effect of the horse disease is, however, clearly perceptible in the sudden fall of 22,000 tons a week ago, and of 29,000 tons now. The total tonnage this year by these canals is still 359,331 tons in advance of last year's transportation.

In spite of the propensity of all men to wait to the last moment before supplying themselves, it is not probable that the line consumers are much, if any, short of stock, and the question of an advance in prices is narrowed down to the simple question of the effect of the present deadlock upon stocks, and the more intricate question of its effect upon the tone of the market. As to stocks, it is impossible to allot any great importance to this delay, which must be temporary, and is, at most, only partial. But it will probably have its effect in stiffening prices for the next month at all events, and will not be without its advantage to dealers. If prices can be maintained for December and January, dealers may think themselves fortunate.

Bituminous Coal.

One circumstance may operate with considerable effect to sustain the rates of anthracite; that is, the fact that soft coal is in excessive demand, and at high prices. This demand comes from those English customers who have been coquetting with us for some time, and now seem to be quite "willin'." The Cumberland region is especially favored, and can dispose of all the coal its animals can get out of its mines. The Consolidation Company is running over eighty cars a day on the Pennsylvania road, and one hundred and fifty on the Baltimore and Ohio. There is some trouble about getting cars, the supply being short, and what with the extra demand, obstruction in transportation, and difficulty in mining the coal, prices are up, and bid fair to remain up. As yet there is no steadiness in the market, and coal is quoted all the way from $6 75 to $7 50 in New York. The former of these appears to be really an impossible price, for much better rates can be obtained for all the coal that comes forward, and the latter is also an outside limit.

To these causes for the advance in the price of soft coal may be added another—strikes in the Pennsylvania region. A demand by the miners for an advance of ten cents a ton not being acceded to, nearly all the bituminous colliers have struck work, one of the notable exceptions being the Derby mine, the owners of which, having large contracts, were forced to concede the terms asked. But the temper of the owners appears to be firm, and as yet no signs of a compromise or other means of arranging the dispute have appeared. Winter is coming on, it is true, but the miners' pockets are full, and they are reported to be as determined to have their advance, as the owners are decided to refuse it.

Thus it is apparent, that in discussing the question of prices for the future, there are many circumstances to be considered. It seems not improbable that the present rates will be sustained in December, but, beyond that, the most sagacious would hardly dare to prophecy.

Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending November 16, 1872, compared with the week ending Nov. 18, 1871.

COMPANIES.	1871. WEEK.	1871. TOTAL.	1872. WEEK.	1872. TOTAL.
*Phila & Reading R.Rt.	127,351	5,063,370	129,268	5,216,162
*Schuylkill Canal	29,417	956,040	24,306	776,734
*Lehigh Valley R. R.	64,521	2,115,082	63,048	2,915,678
Lehigh & Sus. R. R.	35,090	1,133,488	47,911	1,548,277
Lehigh Canal	22,991	692,934	12,666	737,733
Scranton North	15,899	491,827	16,346	713,665
" South	42,556	1,075,714	40,754	1,850,130
Penn. Coal Co., rail	25,054	663,316	27,676	1,081,914
" " " canal	239	13,962	....	5,997
Del. & Hud. Canal Co.	40,625	954,412	6,678	1,336,215
" " East	7,181	299,928	9,071	494,301
" " West	3,078	103,072	11,711	378,583
" " South	9,212	291,559	8,287	346,314
Shamokin	13,035	572,934	14,987	511,551
Trevorton	....	.....	....	....
Lykens Valley Coal Co.	2,301	85,036	..	2,085
Wyoming North	....	.....	....	....
Wyoming South	....	.....	....	....
P. N. Y. C. & R. R. Co.	....	104,987	13,507	565,147
Williamstown Col'y	....	....	....	....
Big Lick Col	3,373	132,436	....	10,591
Total	441,623	14,750,097	426,166	18,511,077
1870	426,166			14,750,097
Increase	...			3,860,980
Decrease	15,457			

* These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1871 and 1872.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Nov. 16, 1872, compared with week ending Nov. 18, 1871.

COMPANIES.	1871. Week.	1871. Year.	1872. Week.	1872. Year.
C. & O. Canal	15,375	629,765	12 996	600,977
B. & O. R. R.	23,585	1,096,342	30,358	1,114,355
Penn. S. Line	....	.....	970	5,422
H. & B. T. R. R.	5,569	285,447	6,599	269,610
*Harrisburg & D.	11,290	492,235	8,769	445,006
*L. V. R. R.	3,021	352,480	375	26,210
P. & N.Y.C. & R. Co.	....	.....	5,897	326,661
Cumberl'd Branch Canal	5,433	185,590	3,709	197 868
" Railroad	1,679	62,797	884	20,359
Total	65,952	3,104,596	70,557	3,006,468
		3,006,468	65,952	
Decrease		98,128		
Increase			4,605	

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending November 16—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1872, tons ct	WEEK 1871, tons ct.	YEAR 1872 tons cwt.	YEAR 1871, tons cwt.
Wyoming Region	41839 11	32197 01	1346436 00	1151713 05
Upper Lehigh Region	4481 09	3973 00	180373 03	90049 03
Hazleton Region	3180 02	6533 03	232967 18	197651 05
Beaver Meadow Region	4928 18	3122 04	146671 10	69544 09
Mauch Chunk Region	8685 00	8932 14	392179 08	200380 00
Trescow Region				
Mahanoy Region				
Totals	63115 00	54758 02	2298617 19	1709338 02
Increase	8356 18		589279 17	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	47911 00	35090 07	1548276 17	1133488 10
Forwarded East of Mch Chunk by Canal	7800 00	14476 04	477427 16	397236 11
Delivered at and above Mauch Chunk	1752 06	1608 19	55555 06	59744 15
L. V. R. R at Packer'n	433 18	356 16	13240 07	27662 06
Delivered to L. & B. R. R. at Plymouth Bridge	5217 17	3225 16	240117 13	91203 01
Totals				
Of the above there was transported on acc'nt of L. C. & N. Co.	16587 16	13791 04	593573 05	297732 08
W.-B. C. & I. Co.	25319 08	19787 13	884124 06	767543 12
Tota's	41907 04	32878 17	1478697 11	1065276 00
Increase	9028 07		414421 11	
Decrease				

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Nov. 16, 1872.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	28,329	15
" Port Carbon	5,807	00
" Pottsville	3,180	19
" Schuylkill Haven	23,908	12
" Pine Grove	5,740	13
" Tamaqua	13,096	13
" Harrisburg	9	08
" Dauphin	5,657	06
Total	85,730	06

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	3,403	14
" Mill Creek "	1,900	13
" Schuylkill Valley Scales	650	10
" Mt. Carbon "	957	06
" Cressona "	8,401	01
" Pine Grove "	....	
" Tamaqua "	2,532	17
Total	22,846	01

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	317	12
" N. C. R. R. passing Locust Gap	1,894	19
" " " Shamokin	5,461	14
" " " Herndon	....	
Total	7,674	05

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,199	16
" Lebanon & Pine Grove Branch	626	07
Total	1,826	03

CONSUMED ON LATERALS.

From Frackville Scales	316	09
" Mill Creek "	575	16
" Schuylkill Valley Scales	1,440	07
" Mt. Carbon "	1,162	13
" Cressona "	699	18
" Pine Grove "	139	02
" Tamaqua "	244	09
Total	4,578	14

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	5,114	12
Cat. & Wpt. Br. Sent West	29	01
" " Rupert, Cat. & Wpt. Br.	20	10
" " Allentown, E. Penn'a Br.	267	10
" " Alburtis, "	....	
" " Oreland, G. & N. Br.	777	13
" " Connecting R. R.	....	
" " Willow Street R. R.	403	09
Total	6,612	15

BITUMINOUS.

From Harrisburg	8,748	19
" Connecting R. R., G. & N. Br.		
" Junction R. R.	20	00
Total	8,768	19

COAL FOR COMPANY'S USE.

Anthracite	6,164	15
Bituminous	160	00
Total.	6,324	15

RECAPITULATION.

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	85,730 06	87,008 10	d 1,278 04
For Shipment by Canal	22,846 01	27,010 03	d 4,164 02
Shipped Westward via Northern Central R. R.	7,674 05	5,871 08	i 1,802 17
Shipped West or South from Pine Grove	1,826 03	2,826 05	d 1,000 02
Consumed on Laterals	4,578 14	3,305 00	i 1,273 14
Lehigh and Wyoming Coal	6,612 15	1,329 04	i 5,283 11
Total Anthracite paying freig't	129,268 04	127,350 10	i 1,917 14
Bituminous	8,768 19	11,289 12	d 2,520 13
Total of all kinds paying freig't	138,037 03	138,640 02	d 602 19
Coal for Company's use	6,324 15	5,440 08	i 884 07
Total Tonnage for Week	144,361 18	144,080 10	i 281 08
Previously this year	5789130 04	5629199 18	i 159,930 03
Total to date	5933491 19	5773280 08	i 160,211 11

SHIPPED BY CANAL.

From Schuylkill Haven	22,222 00	21,427 03	d 5,205
" Port Clinton	2,084 00	1,935 00	i 149 00
Total Tonnage per Week	24,306 00	29,362 08	d 5,056 08
Previously this year	772,428 00	936,541 06	d 164,113 06
Total to date	796,734 00	965,903 14	d 169,169 1

Lehigh Coal and Navigation Company,

Report of Coal transported over the Lehigh Canal and L. & S Div of Central Railroad of New Jersey for the week ending Nov. 16, 1872, and for the year 1872.

	WEEK.	YEAR.
Forwarded East of M'ch Chunk by Rail	47,911 00	1,548,276 1
Delivered at and above do., ...	1,752 05	55,555 06
Forwarded East of do., by Canal	12,666 02	737,732 13
	62,329 07	2,341,564 16
Corresponding period last year—		
Forwarded East of M. Chunk by Rail..	35,090 07	1,133,488 10
Delivered at and above do., ..	1,608 19	59,744 15
Forwarded East of do., by Canal	22,691 06	694,934 01
	59,330 12	1,886,167 06
Increase on Railroad	12,963 19	410,598 18
Decrease " "	.....	
Increase on Canal	.....	44,798 12
Decrease " "	10,025 04	
Of the above there was transported on account of—		
Lehigh Coal Nav. Co	19,730 11	825,422 02
Wilkesbarre Coal & Iron Co	25,319 09	886,124)
	45,050 00	1,711,546 03
Corresponding period last year—		
Lehigh Coal & Nav. Co	19,401 13	545,718 01
Wilkesbarre Coal & Iron Co	19,787 13	767,543 12
	39,189 06	1,313,261 13
Increase	5,860 14	398,284 15
Decrease	.....	.....

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Nov. 15, 1872, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	10,771 12	494,012 09
" Hazleton	42,370 07	2,123,606 17
" Upper Lehigh	38 05	2,943 01
" Beaver Meadow	15,143 04	741,095 16
" Mahanoy	10,321 15	369,746 06
" Mauch Chunk	22 13	2,600 05
Total	78,617 16	3,734,014 13
Same time last year	83,215 04	2,651,845 13
Increase		1,082,169 00
Decrease	4,597 08	
Forwarded East from Mauch Chunk by rail	63,048 01	2,915,678 01
Same time last year	64,520 11	2,115,182 02
Increase		800,595 19
Decrease	1,472 10	
DISTRIBUTED AS FOLLOWS.		
Forwarded East from Mauch Chunk by rail	62,058 18	2,871,187 17
do East for use L. V. R. R.	989 03	44,490 04
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,079 12	54,313 01
To P. & N. Y. R. R.	7,073 15	344,584 07
To N. C. R. R., at Mount Carmel		2,664 09
To D. H. & W. R. R.	1,156 04	29,400 17
To L. & S. R. R. at Packerton for rail	609 01	13,259 05
Delivered at M'h Chunk	66 05	2,203 09
Delivered on line of road above Mauch Chunk	520 10	15,343 03
To L. S. & R. R., at Penn Hav., for railroad		4,011 19
Do. for canal	2,506 09	223,511 09
To Lehigh Canal Mauch Chunk	2,607 19	118,878 08
To Catawissa Railroad		9,663 04
Total	78,617 16	3,734,014 13

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending November 16, 1872.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.	7,073 15	344,584 07
" Lack. & B. R. R.	776 07	71,700 01
" Pleasant Valley R. R.	4,210 14	99,181 08
" Sul. & Erie R. R.	1,446 07	49,681 03
Total	13,507 03	565,146 19
Distributed:		
To Lehigh Valley R. R.	1,311,15	37 030 00
To Lack. & B. R. R.	15 11	1,083 10
To S. Central R. R.	1,711 05	107,587 16
To Ithaca & A. R. R.	3,847 16	88,993 07
To Erie R. W. Pockets for shipm't.	3,651 14	247,895 14
To individuals on line of road	1,032 00	22,829 01
To points at & above Coxton for use of Co.	564 10	22,989 06
To points between Waverley and Elmira	1,372 12	36,698 05
Total	13,507 03	565,146 19
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	5,805 12	324,019 17
Shipped south from Towanda	....	2,172 12
Northern Central R. R.	91 00	468 12
Total	5,896 12	326,661 01
Distributed:		
To Erie Railway	5,416 09	222,305 10
To So. Central R. R.	389 03	31,459 04
To Ithaca Valley R. R.	....	120 03
Lehigh Valley R. R.	91 00	1,201 01
To individuals on line of Railroad.	.....	1,294 12
To points on line of road for use of Company	.....	280 11
Total	5,896 12	326,661 01
Grand totals transported:		
Anthracite	13,507 03	565,146 19
Bituminous	5,896 12	326,661 01
Total	19,403 15	891,808 00

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, November 16, 1872.

	WEEK.	SEASON.
North	26,746 14	2,267,705 02
South	8,287 08	346,314 02
Total 1872	35,034 02	2,614,019 04
Corresponding time in 1871:		
North	54,501 13	1,389,489 03
South	9,212 10	291,558 14
Total	63,714 03	1,681,047 17
Increase North		
Decrease North		
Increase South		
Decrease South		
Total increase 1872		932,971 07
Decrease	28,680 01	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Nov. 16, 1872.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	16,345 19	713,565 00
Shipped South	40,753 19	1,850,129 18
Total	57,098 18	2,563,794 19
For the Corresponding time last Year:		
Shipped North	15,938 14	491,827 02
Shipped South	42,556 09	1,075,714 09
Total	58,555 03	1,567,541 11
Increase		996,253 07
Decrease	1,456 05	

Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co. for the week ending Nov. 16, 1872.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	6,678	1,736,215
By Railroad, East	9,071	494,301
" " West	11,711	378,583
" " South	8,287	346 314
Total Tons	35,747	2,555,413
For the same period last year.		
	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	40,625	954,412
By Railroad, East,	7,181	299,928
" " West	3,078	103,072
" " South	9,212	291,559
Total Tons	69,096	1,648,981
Increase	906,442	

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the week ending November 16, 1872.

	Tons. Cwt.	Tons. Cwt.
East	961 04	
West	14,026 00	
		14,987 04
Same time last year		13,035 09
Increase		1,951 15
Decrease		.....
Total amount shipped to date		511,550 13
Same time last year		572,933 13
Increase		....
Decrease		61,383 00

Lehigh Canal Coal Trade.

Shipped for the week ending November 15, 1872.

	Week. Tons. Cwt.	Week. Tons. Cwt.
Total from Mauch Chunk Region	3,142 16	231 848 17
" " Hazardville "	690 11	8,437 09
" " Beaver Meadow "	2,750 19	145,431 02
" " Mahanoy "	541 07	12,006 15
" " Hazleton "	2,506 09	223,045 02
" " Upper Lehigh "	484 09	27,917 00
" " Wyoming "	2,353 06	86,375 05
" " do do Hazardville	196 05	2,671 03
Total	12,663 02	737,732 13
Corresponding week last year	22,691 06	692,934 01
Increase	.....	44,798 12
Decrease	10,025 04	

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, November 16, 1872.

	Tons. Cwt.
From Schuylkill Haven	22,222 01
" Port Clinton	2,084 00
Total for week	24,306 00
Previously this year	772,425 00
Total	796 731 00
To same time last year	956,039 14

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending November 16, 1872.

	1873. WEEK.	1873. YEAR.	1871. WEEK.	1871. YEAR
By Railway	27,625 11	1,081,914 10	25,253 10	663,313 15
" Canal	.....	5,996 13	239 01	13,962 04
Total	27,625 11	1,087,911 03	25,292 11	677,275 19
Increase 1872. 410,635 01				

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Nov. 13, and during the year 1872, compared with the corresponding period of 1871.

WEEK.

	C. & O. C'l Tons. Cwt	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt	Total. Tons. Cwt.
1872	12,396 18	30,367 15	970 09	44,324 02
1871	15,574 15	23,585 00	....	38,959 15
Increase	6,772 15			5,364 07
Decrease	2,378 17		970 09	

YEAR.

1872	600,977 00	1,114,355 01	5,421 16	1,720,753 17
1871	629,707 14	1,056,342 09	....	1,726,050 03
Increase	....	18,012 12	5,421 16	....
Decrease	28,730 14	....	....	5,296 06

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1872	3,709 07	884 02	4,593 09
1871	5,403 07	1,678 14	7,082 01
Increase	.....	.....	.....
Decrease	1,694 00	794 12	2,488 12

YEAR.

1872	197,868 03	20,358 11	218,226 14
1871	185,590 03	62,797 06	248,387 09
Increase	12,278 00		
Decrease		42,438 15	30,160 15

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

Company Coals.

November, 1872.

	L.	Str.	Grs.	Eg.	Sto.	Chest
*Scranton at E. Port	3 45	3 45	3 65	3 70	4 00	3 50
*Pittston at Newburg	3 80	3 80	3 80	3 80	4 00	3 80
*Lackawana at Weehawken	4 01	4 10	4 10	4 30	4 00	3 60
Wilk'b're at Hoboken	3 60	3 65	3 85	3 85	4 60	4 10
Old Co. Lehigh at Pt. John'n	5 25	—	4 50	4 50	4 60	4 00
Lehigh at Eliz. Port	5 00	—	4 60	4 60	4 80	4 00

For freights to different points see "Freights."
To contractors only.

SCHUYLKILL.	AT NEW YORK. November 24. R. A.	W. A.	AT PHILADELPHIA. November 24. R. A.	W. A.
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	
Egg	5 25	4 75	— —	— —
Stove	5 50	5 00	— —	— —
Chestnut	4 25	— —	— —	
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 35	— —	— —	— —
Broken	4 60	— —	— —	— —
Egg	4 60	— —	— —	— —
Stove	4 85	— —	— —	— —
Chestnut	4 35	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.				
Honey Brook, Leh'h W. A.	4 00@5 00		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Creek " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Old Comp'y's " "	4 00@5 15		— —	— —
Room Run " "	4 00@4 50		— —	— —
McNeal " "	— —		— —	— —
Girardville " "	— —		— —	— —
Hill & Harris " "	— —		3 10@4 00	— —
Shamokin " "	— —		— —	— —
Lykens Valley " "	— —		— —	— —
Broad Top " "	— —		— —	— —
McMichael " "	— —		3 25@4 25	— —
Henry Clay " "	— —		— —	— —
Powelton "	— —		— —	— —

Prices at Baltimore—November, 1872.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 35@5 60
Pittston and Plymouth, do	5 25@5 50
Shamokin Red or White Ash, do	5 50@5 75
Lykens Valley Red Ash, do	6 25@6 50
Zerba Valley	
Treverton	
By retail, all kinds per ton of 2,240 lbs	7 25@7 50
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	@4 75
Fairmont and Clarksburg gas f. o. b. at L. Point	6 00
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Consolidation Coal Co.'s on board N. Y.	
Maryland Coal Co. "	

Prices at Georgetown, D.C., and Alexandria, Va.

November, 1872.

George's Creek and Cumberland f. o. b. for shipping [nominally.	$4 38@4 50

Prices at Havre de Grace, Md.

November, 1872.

Wilkesbarre and other White Ash for Cargoes	$ @4 75
Lykens Valley	@5 75
Shamokin Red or White Ash	5 00

Bituminous Coals (Cumberland).

Georgetown, F. o. b.	$4.25
Baltimore "	4.65
New York "	6.60

Prices of Gas Coals.

November, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse.	Slack.
Block House	$2 00	$1 00
Gowrie	1 75	— 80

Vessels are being chartered at $4 25.

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal,
Pictou nett	$2 25	1 25
Sydney	2 25	- 80
Lingan	1 75	- 80
Caledonia	1 75	- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.

	Currency.
Westmoreland	$7 10 @— —
Fairmount Gas Coal Co. of N. Y.	7 00 @— —
Despard Coal Co.	7 00 @— —
Penn.	7 10 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —
AT PHILADELPHIA.	
Westmoreland	7 00 @— —

Prices of Foreign Coals.

November, 1872.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	12 00@13 00
" House "	19 00@20 00
" Orrel	14 00@16 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$16 00@18 00
"Cannel, "	19 00@23 00
Per ton 2,000 lbs. delivered.	

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption ($1 85 less 55c. drawback)	$1 30
For reshipment	1 75

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 66
C. R. R., N. J., Phillipsburgh to Elizabethport	0 98
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$1 99

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Phillipsb'g	$0 66
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	0 98
Shipping expenses	25
Wharfage	
Total	$1 99

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	66
Morris & Essex R. R. Phillipsburgh to Hoboken	0 98
Shipping expenses	25
Wharfage	
Total	$1 99

TO SOUTH AMBOY.

L. V. R. R.	66
B. & D. R. R.	98
Cam. & Am. R. R.	
Shipping Expenses	25
Total	$1 99

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	0 70
C. RR. of N. J. Phillipsburgh to Elizabethport	0 98
Shipping expenses	25
Wharfage	10
Total	$1 99

Foreign and Provincial Freights.

November 1872.

Foreign.
Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.

Sydney	$3 05
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

Freights.—November, 1872.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada.	Anthracite. From Elizabethport, Port Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury						
Bangor		2 75			2 55	2 60
Bath		2 75				
Boston	3 10	3 00		2 30	2 55	2 60
Bridgeport	2 75	2 50		1 00	1 25	1 25
Bristol				1 40	1 65	1 70
ConassetNar'ows	2 25					
Derby				1 30	1 40	1 45
Dighton	2 85					
East Cambridge				2 30	2 55	2 65
Fall River	2 75	2 75		1 40	1 65	1 70
Hackensack						
Hartford		3 00		1 65	1 85	1 90
Hoboken	2 10			55	60	65
Jersey City	2 10			55	60	65
Lynn						
Middletown				1 35	1 55	1 65
Mystic		2 75		1 30	1 50	1 60
New Bedford	3 00	2 75		1 40	1 65	1 70
Newburyport	3 10	3 00		2 60	2 75	2 80
New Haven	2 75	2 50		1 00	1 25	1 25
New London	2 75	2 75		1 30	1 45	1 55
Newport	2 35	1 80		1 40	1 65	1 70
New York	2 25	2 00		55	60	65
Norwalk	2 50	2 60		1 00	1 25	1 25
Norwich		2 75		1 40	1 55	1 65
Pawtucket		2 75		1 50	1 70	1 80
Portland	3 25	3 00		1 15	2 25	2 35
Portsmouth, N. H		3 25		2 50	2 70	2 75
Providence	2 75	2 75		1 40	1 65	1 70
Rockport						
Saco						
Sag Harbor		3 00		1 30		
Salem	2 70	3 00		2 35	2 55	2 60
Stamford				1 00	1 25	1 25
Stonington				1 35	1 50	1 55
Taunton				1 90	2 20	2 30
Warren				1 40	1 65	1 70
TO RIVER PORTS						
Albany		2 40				
Catskill						
Cocksackie						
Coeyman's						
Cold Spring	2 30	2 25				
Fishkill						
Haverstraw						
Hudson	3 25	2 30				
New York						
Nyack	2 25					
Poughkeepsie	2 50					
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy	3 00	2 50				
West Point						
Yonkers						

St. Thomas	$5 00 Gold.
Martinique	5 00 "
Demerara	6 00 "
New Orleans	6 00 "
Mobile	6 00 "

MARKET REVIEW.

NEW YORK, Nov. 21, 1872.

IRON.—The market for Scotch Pig shows no change, the sales being only in a jobbing way at about our quotations. American Pig is quiet at previous figures. We hear of no sales. English Rails are quiet at $72a$73 for new, and nominally $51 currency for old. In Scrap there has been a lull again, and we hear of only small lots at about $47a$50 from yard, and $42a$43 from dock. All kinds of Wrought Iron from store have again declined—Oval and Half Round $5 Scroll $10, and Refined Bar and all other kinds $7,50 per ton, bringing ⅜ to 2 inch Round and Square Bars, 1 to 6 inches wide, by ¼ to 1 inch thick, to $105, and Scroll $120 to $150 per ton. Russia Sheet is quiet at 15 cents gold for No. 1 Strained, and 16 for Sound. Common Sheets are nominally as quoted.

PHILADELPHIA Nov. 18 (From a circular of Edward Samuel.)—The best makes Pig Iron are held at about quoted figures, but those not so well known are offered considerably lower. The tone of the market is weak, and it is generally conceded that there is but little chance of a recovery this year. Old Rails are in full supply, with but little demand. Scrap is offered freely. In Manufactured, the Philadelphia mills have again reduced the base price, it now being 4½ cents per lb. Closing prices of standand qualities American No. 1 Foundry Pig, at Furnace, $50a$51; No. 4 White and Mottled, $37a38; Scotch Pig, cargo lots for shipment, $47,50a$49; and No. 1 Wrought Scrap, ex-ship, $45a46 currency.

COPPER.—New Sheathing is steady at 43 cents, and Bolts and Braziers 45; Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts 35, net cash. The causes noted in our last continue to exert an unfavorable influence upon Ingot, and prices are irregular and lower with a very small business; the sales embrace about 150,000 lb. Lake in lots at 30¾a31 cents. English is offered freely at 28½ cents without buyers.

LEAD.—Foreign Pig remains very quiet—$6,55a$6,62½ is asked for ordinary. Refined firm at $6,87½a$7 gold. Bar 9¼ cents, Sheet and Pipe 11, and Tin-lined Pipe, 16½ all less 10 per cent. to the Trade.

SPELTER.—There is no demand for Foreign, and prices are entirely nominal. Say $6,62½ gold. Domestic is quoted at 9 cents currency. The stock accumulates, and is now about 600 tons.

TIN.—Pig is still entirely neglected and prices are irregular and lower, though yet nominal. Straits can be bought at 30½a31 cents, English 31a31¼ (the stock being relatively small, it is consequently a little firmer than Straits,) and Banca 35 all gold. The market for Plates is in the same demoralized condition as that for Pig; prices have gradually softened and shaded until a further decline of fully 50a75 cents per box may be noted, but even at this considerable break there is little or no demand, and, though we revise our quotations on Third Page, they must still, in the absence of business, be called nominal,

ZINC.—Sheet is very steady, but rather quiet at 10½ cents currency; Manganese black oxide 4 cents; do. gray per oxide 5½

METALS.

NEW YORK, November 21, 1872.

IRON.—Duty: Bars, 1 to 1¼ cents ₰ lb; Railroad, 70 cents ₰100 lbs.; Boiler and Plate, 1¼ cents ₰ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₰ lb; Pig, $7 ₰ ton; Polished Sheet, 3 cts. ₰ lb; Galvanized 2¼; Scrap Cast, $6; Scrap Wrought, $8 per ton.

All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₰ ton	55 00@56 00
Gartsherrie	53 00@54 00
Glengarnock	50 00@51 00
Eglinton	47 00@48 50
Pig, American, No. 1	50 00@55 00
Pig, American, No. 2	48 00@51 00
Pig, American, Forge	41 00@45 00
Bar Refined, English and American	— —@120 00
Bar Swedes, assorted sizes gold	120 00@130 00
	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ⅜ & ⅞ & ¾ 2 sq. & 6 to 12 x ⅜ & ½	145 00@155 00
Bar, Refined, ⅝ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	— —@105 00
Bar, Refined, 1¼ to 6 by ¼	110 00@— —
Bar, Refined, 2½ to 2⅞ round 1 & 1½ by ¼ & 5:16	112 50@— —
Large Rounds	112 50@125 00
Scroll	120 00@150 00
Ovals and half-round	130 00@150 00
Band	— —@122 50
Horse Shoe	117 00@127 50
Rods, ⅜ to 3-16 inch	110 00@152 50
Hoop	127 50@172 50
Nailrod	@ 9
Sheet, Russia, as to assortment (gold)	16 @ —
Sheet, Singles, D. and T. Common	—7 @— 8
Sheet, D. and T. Charcoal	—8½@— 9
Sheet, Galv'd, list 10 per cent, discount	—@— —
Rails, English (gold), ₰ ton	72 00@— —
Rails, American, at Works in Pennsylvania, currency	80,00@— —

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₰ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₰ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	26 @— 28
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot	30¾@— 31
Copper English Pig	28½@— —
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ₰ 100 lbs.; old Lead, 11½ cents ₰ lb; Pipe and Sheet, 2¼ cents ₰ lb.

Galena, ₰ 100 lbs	$— @— —
Spanish (gold)	6 50 @6 62½
German, do.	6 50 @6 62½
English do.	6 6¼@7 00
Bar (net)	9 25 @— —
Pipe (net)	— — @11 00
Sheet	— — @11 00

Colwell, Shaw & Willard Tin-Lined Lead Pipe 16½ cts. ₰ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ₰ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₰ lb; over 11 cents, 3½ cents ₰ lb. and 10 ₰ cent ad val. (Store prices.

English Cast (2d and 1st quality) ₰ lb	— 18 @— 22
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 11½@— 16
English Machinery	— 11½@— 14
English German (2d an 1st quality)	— 11¾@— 12
American Blister "Black Diamond"	— —@— 11½
American, Cast, Tool do.	— —@— 17
American, Spring, do.	— —@— 11
American Machinery do.	— —@— 11½
American German, do.	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₰ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₰ cent.; Roofing 25. ad val.

	Gold ₰ lb.
Banca	35 @—
Straits	— @31
English	— @31½

PLATES.

	Fair to Good Brands. Gold.	Currency.
I. C. Charcoal, ₰ box	$11 00 @11 25	$13 00 @13 25
I.C. Coke	10 00 @10 50	11 50 @12 00
Coke Terne	9 00 @ 9 50	10 50 @11 00
Charcoal Terne	10 00 @10 50	11 50 @12 00

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign (gold) p. 100 lb.	6 62½@ 6 87½
Plates, Domestic p lb.	8¾ @— 10½

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb

Sheet per lb.	— 10 @ 10½

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Nov. 21, 1872.

The following reports from the San Francisco Stock Market are of the dates of the 14th and 21st ult. Compared with our last the market has generally advanced, the only exceptions being a decline of $17 in Raymond & Ely and $1 in Belcher.

	Nov. 14.	Nov. 19
Savage	88	87
Crown Point	117	120
Yellow Jacket	106	108
Kentuck	—	220
Cholliar Potosi	68	69
Gould & Curry	197	210
Belcher "New Issue"	108	105
Imperial	11	11
Raymond & Ely	119	109
Meadow Valley	23	21½

DROWN & CORLISS,

ANALYTICAL CHEMISTS,

AND

CONSULTING METALLURGISTS.

1123 GIRARD STREET,

PHILADELPHIA.

THOMAS M. DROWN. GEORGE F. CORLISS.

W. B. COGSWELL,

Civil & Mechanical Engineer.

SPECIALITY:

Blast Furnace Construction.

P. O. Address

Franklin Iron Works,

Oneida County,

Nov. 19:1y N. Y.

THE

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POPULAR SCIENCE DEPARTMENT.

The Contradictions of Science.

Abstract of a Lecture delivered before the Polytechnic Branch of the American Institute by Professor W. H. PEPPER, F. R. S.

The object of my lecture to-night is to show you certain things which are anomalous, contrary to known facts, and seem to oppose Nature; to show you that we cannot advance very far in any science without obtaining puzzling results and apparent contradictions; and I hope to demonstrate to you that the most startling results are clearly explicable by the simple laws of Philosophy. I prefer to show you that science may be taught with an exceedingly small and simple apparatus, if we will only take the trouble to study it.

Let us begin by taking these two eggs. The first I will put into this jar of water, and you see that, in obedience to Newton's law of gravitation, it descends and rests upon the botton. Now we will take the other egg and lay upon it our command—"Travel no further than the center of the glass," and you see that in obedience to that command, as it reaches the center of the jar, it stops there. It is a repetition of the old story of Mahomet and his coffin. It was said that the dust of Mahomet was too sacred to be allowed to touch the earth, and it was therefore put in a steel coffin, and magnets were placed all around it, and it was held suspended in the air. But we have no magnets here; the explanation is more simple than that. We have simply in the first jar, and in the upper half of the second, pure water, and in the lower half of this second jar a saturated solution of common salt. It is a mere repetition of the housewife's expedient. When she wants to know if her brine is strong enough for pickling pork, she tries if it will bear an egg. Thus you see, at the outset, with a little water, some salt, and two eggs, we have produced an apparent, but not, I am sure, to your minds, a real contradiction in science.

Let us now try something chemical. We will take a well-known chemical element, which has put millions of money into the pockets of various persons, and which is called chlorine. The gas of chlorine has been used for bleaching purposes; but it was discovered by Prof. TENNANT, of Glasgow, that in the form of chloride of lime the bleaching power is not destroyed, while the injurious effects of the gas upon the lungs are prevented. Here is some chloride of lime, on which we will pour water. Thirty or forty years ago all the linen manufactured in England was sent to Holland to be bleached. There it was bleached by the action of the sun, of ozone, and of the moisture of the atmosphere. If the season was good, the linen came back properly bleached; but it remained out of the hands of the merchants for nine months. I venture to say that now as much bleaching can be done on one acre of land as would formerly have been done on ten acres, and that as much bleaching can be done in nine days as would formerly have occupied nine months. And it is all due to this remarkable agent—chlorine. It is a money maker. You are not to despise it because it has a hard name. That is the worst of chemistry, that it is full of hard names. I have here two pieces of paper, on which I have written the word "Proteus," a name belonging to the heathen mythology, and indicating change. Proteus was supposed to be able to change himself as he pleased; from a grasshopper to an elephant, for instance. With this brush I will paint over these names with the chloride of lime, and you will see that the names will be bleached out, and in a few minutes the paper will be as white and as clear as the paper above. Now that these two pieces of paper are made white, let us try what will be the effect of the chlorine on the two pieces of white paper above. First, I will add a little water, to dilute it a little more, and now I will paint over these upper pieces. Strange to say, there appears instantly in clear dark letters, following the strokes of the brush, the very word "Proteus," which the chlorine had caused to disappear below. How shall we reconcile this? It is like the man in the fable, who blew hot and cold with the same breath. First, the chlorine bleaches the word out, and then it produces it. Let me explain it. The name on the lower papers was written with a solution of indigo. Chlorine, at first, had a bad character among stocking manufacturers, for they found that the goods were made rotten by the substances used to bleach them. They therefore inserted a blue and red line in the upper part of the stocking, and said to the bleachers, "If you destroy our blue and red line, we shall demand compensation." The consequence was, that the bleachers, to avoid injuring the blue and red line, made experiments, and, after a time, extended their bleaching process over sixteen different operations. Indigo, with which the blue line was made, and with which these names were written, is easily destroyed and bleached out by chlorine. The names on the upper papers were written with a solution of iodide of potassium and starch, and were invisible. But chlorine has a habit, very common in this wicked world, of elbowing others out of the way, and quietly taking their places. The chlorine drove away the iodine, and took possession of the potassium. Then the iodine, poor, unfortunate element, wandering about, met with the starch, and the two made a match of it, and produced this dark color. Thus, with a few bits of paper, some iodide of potassium, starch and chlorine, I have again produced an apparent, but not, I am sure, to your minds, a real contradiction in science.

I wish next to call your attention to the troubles that chemists meet with in courts of justice. Here is a jar containing a terrible poison. The fluid looks like pure water, but it contains a large amount of mercury. Now, you know that mercury is opaque and brilliant. Yet here it is apparently changed to water. We should not laugh at the labors of the ancient alchemists. Consider what wonderful transmutations they were able to make, and blame them not for expecting to make others. There are those who still believe in alchemy. A very particular friend of mine expended hundreds of pounds in alchemy, and I did not discover it until near the end of the drama, as it proved to be. He said to me, "I do not intend to use this money for myself. I intend to build churches; to endow hospitals; to do a great deal of good with it." I asked him who was the alchemist to whom he was entrusting his money, and he consented to take me to see him. It was in the outskirts of London. We came into the laboratory, and my friend says to him, "You have mercury maturing into gold?" "Yes; you see it in that flask." I poured the fluid off, and what do you suppose the particles were? He had thrown into his crucible an amalgam of mercury and gold, and when the amalgam was evaporated, the gold remained. When my friend learned the truth, he gave way in despair, and in about a month he died.

In this jar I have said that there is mercury. How shall we prove it? The iodide of potassium is a test for mercury, changing it first into a yellow and then to a scarlet. Here is some iodide of potassium, itself a clear and colorless fluid; and let us try it. Chemistry is nearly allied to cookery, only you can't eat the things after you have made them. Yes, there is certainly mercury there; for it has changed it to a primrose yellow, and then to a scarlet. Let us add a little more of the test. Well! I never! What does that mean? It has become as clear and as colorless as at first. How do you account for that? Very easily. The iodine unites with the mercury and forms a scarlet-colored precipitate; but that precipitate is dissolved in the iodide of potassium, if a larger quantity is added, leaving the liquid again colorless.

Now, consider the case of an expert who has to go before the court in a criminal case and testify as to the existence of a poison in a particular case. He may test the substance for the poison, and by adding a little too much, or not enough of the test, he misses it. One scientific man finds it, and another one does not find it; and they testify in opposition to each other before the court, and that, too, in cases where a man's life depends on the result. It seems to me that in criminal cases the mode of giving scientific evidence should be changed. The matter suspected of containing poison should be placed in the hands of the State officer. Let him select from those who are qualified and willing to make analyses of this kind, three men, and let him send to each a sample. If they are skilled in chemistry, they can only send to him one report, either that it is or that it is not poisoned. Let the three draw up a joint report and sign it. Then let these three chemists be placed on the stand, and examined and cross-examined as much as you please; only let it be understood that philosophy is not in court for the prosecution or the defense, but only as an exponent of the truth. Then I believe the innocent would not run the slightest risk, while the guilty never would escape.

Now we will come to something more extraordinary; and yet I ought not to use that term, for these things only require to be explained and all the wonderment vanishes. I propose to bathe my hands in boiling water and in melted lead. There is nothing more ancient than this very experiment. Strabo tells us that the priests and priestesses of his time were accustomed to walk over burning coals. Again, a Greek play, written 300 years before the Christian era, referring to events which probably occurred hundreds of years before that time, speaks of lifting hot iron masses in the hands, and passing through fire. There are three different ways in which these things may be done; first, by an unusual thickness of skin; second, by the application of some chemical substance; and third, by the interposition of some substance which shall be a bad conductor of heat. My assistant is in doubt whether he will be able to bring in the furnace, which is in the adjoining room. I see that the passage way is crowded, but I doubt not that when you see him coming with the hot furnace and melted lead, you will have the goodness to make room for him. (Laughter.)

In this furnace is a red hot ball. I propose to take this in my hand. I have merely to place on my hand some powdered charcoal, which is a very slow conductor of heat, a sufficient thickness to protect my hand from the heat radiated by the ball. By dipping an eighth of an inch of the charcoal in phosphate of ammonia, or any other incombustible substance, the charcoal is prevented from burning too near the hand. It is now simply a question of time. The heat of this glowing ball, placed upon my hand thus protected, does not affect my hand, and yet if I were to hold it sufficiently long, I should discover that it would be necessary to get rid of it.

You have often seen upon certain leaves, the beautiful drops of dew rolling about without wetting the leaf, and sparkling like the diamond. If a metallic plate is heated sufficiently hot, the water will not wet it, but will assume what is called the spheroidal state. You see that the water in this spoon rolls about like molten lead, and does not wet the spoon. Now we may reverse the conditions. We may fix the water to the hand and let the lead be free to move, and there will still be a space between which the heat does not readily cross. In order to dip the hand in boiling water, it must first be dipped in a very volatile fluid. I shall first thoroughly wet my hands with oil of turpentine, simply to cleanse the skin thoroughly; then I dip my hand into ether, and while it is thoroughly wet with that, I can dip my hand into this boiling water, take out the egg, and lay it on this plate; the vapor from the ether protecting my hand long enough for the experiment. Care must be taken in these experiments not to set the ether itself on fire, for the vapor of the ether is highly inflammable.

Now we will try the melted lead. The hotter the lead, the safer the experiment, for fortune favors the brave. If the lead is on the point of solidifying, when you put your hand in, it will solidify on your fingers, and when you undertake to take off the leaden glove, the skin of the hand will come off with it. I take pains to get rid as far as possible of the thin film of oxide on the surface of the molten lead, lest it should cling to the hand. Now dipping my hand in the strongest ammonia, I can with impunity dip my finger into the molten lead. More than that, with the same precaution, I can dip my hand into it, and take it up like so much quicksilver. (Prof. PEPPER took up several handfuls of the molten lead from the ladle, and threw it into a pail of water standing near.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
JOHN A. CHURCH, E. M.
Editors.

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THE *American Railway Times* is one of the newspapers which suffered in the Boston fire. It had already passed through this ordeal, not very long ago, and now loses nearly everything but the determination which characterises editors as well as other people. In spite of its troubles it will immediately reappear, and we wish it better fortune.

The Government Art Patronage.

"Our government having borrowed the original drawings, castings and core boxes of the handsome lamp standards on the Victoria Embankment, London, are about to erect similar ones in front of the Treasury at Washington." That is a specimen of one of our government's most persistent faults. Congressmen get up a talk about the slavishness of the people in buying French silks and gewgaws, but the most conspicuous patronizer of foreigners is the government in which these very Congressmen are all-powerful. If the government, on the score of economy alone, refuses to patronize its own artists and its own foundries, how can we look to the establishment of art among us on a broad and sound basis? We do not believe in that policy, adopted by most foreign States, of giving orders for works of art, for no other purpose than to help the artists, but we do believe that what art-work there is to do on the public account ought to be given to American artists. It is not a question of money cost, nor of the immediate results. The latter may very possibly be of a lower order than the work we should get from foreigners. But art and artistic industry need all the encouragement they can obtain and the artisans of each country have a moral right to such patronage as their government has to offer. Senator SPRAGUE has been laughed at for the motion he always offers when government buildings are to be furnished—that the carpets shall be of American make. He is right, and the fact that as a wool manufacturer he may derive some infinitesimal benefit from the government patronage of American carpets in no way weakens his position. We wish he could make his motion apply to all other government purchases, and would willingly put up for a time with an inferior make, if the demand for a better article calls out an improvement in the manufacture.

Water Supply and Universal Power.

IN writing upon the subject of a "Universal Power," two months ago, we little thought that the plan proposed would soon approach a practical realization. But already prominent engineers—one of whom is Mr. CRAVEN, late Engineer of the Croton Water Works—are studying the details of a plan which is to fulfill part of the conditions we laid down. The incentive to the work is the Boston fire, and the discovery that to the danger which New York lies under from the inflammable nature of its buildings, is added another which greatly magnifies the risk from that cause. The trials with the self-propelling fire-engine, of which we spoke last week, proved that there was a very serious lack of water in the lower part of the city. As we said then, the pressure at the hydrant on the corner of Broadway and Cedar street was only seven pounds, not enough to fill the pump as fast as it discharged its water. The flow of water in the main was so sluggish that it was evident the supply would fail under the demands of a great fire. In some correspondence on this subject which has passed between General SHALER and Mr. CRAVEN, the former estimates that a fire which would require eight streams to subdue it—that is to say, less than the number of streams often needed to quench city fires—would call for the discharge of 2,400 gallons of water per minute, or 1,440,000 gallons per hour, a quantity greatly beyond the capacity of the Croton supply pipes in some parts of the city. There are, therefore, portions of the city where no fire department, however well organized, could be depended upon to overcome a large fire. This is a radical defect in the present system which must be remedied. The remedy proposed is to use the water of the rivers around New York, and to establish powerful pumping engines for raising it, together with a system of special mains throughout the city It cannot be doubted that such an arrangement would benefit in a marked degree the Croton water supply, nor that its cost would be entirely within the city's means, and would be an economical investment.

Mr. CRAVEN says that the present system of water-pipes in this city is incapable of furnishing great supplies for the immediate extinguishment of fires; that the utilization of the ocean water surrounding us is both desirable and feasible; that the reduction in the cost of maintaining the Fire Department would be nearly equal to the interest on the amount required to construct pumping works. This expense could be still further reduced by selling power to the innumerable warehouses, and stores, and manufactories in the city; and we hope that the plans which are to be drawn up will include estimates for plant large enough to supply the demand from these establishments. The substitution of water for the numerous steam powers in use would itself be one of the best preventives of fire. It is well known that the Boston fire is supposed to have originated in the engine room of a warehouse. The number of similar engines in New York mercantile buildings has been estimated at 1,000, and certainly a thousand horse-power daily is a small estimate for the amount of power which could be sold almost at the start. There is not the least doubt that if this plan of a special system of sea water supply is established, the universal method of power supply will grow out of it. If we could calculate the saving in pay of engineers, consumption of coal, rent of space, cost of boilers and of insurance, and the numerous other economies which would result from the use of water in place of steam, the total would undoubtedly form a very handsome interest upon the cost of the works. It is true that the whole of this saving could not be gathered in to the benefit of the new system, but a large part of it could be so collected.

Five million dollars has been mentioned as the probable cost of establishing the new works, and this sum would, at all events, cover the cost of works for supplying the lower part of the city with water, supposing the new system to be confined to that quarter which is in greatest danger from the present lack of pressure. It is just in this district that small motors are most in demand. The sale of power to 500 buildings at an average of $1,000 each, would pay the interest on that sum, and perhaps the cost of maintenance. That $1,000 is a moderate estimate, may be seen from the fact that the pay of an engineer alone will amount to that, and water machinery would need no special workman.

We spoke in our former article of the disadvantages which must necessarily arise from the use of sea water in extinguishing fires; but the use of a special water system for the Fire Department is not necessarily connected with the use of sea water. The former is unquestionably good, and the only point to be discussed is the one of cost; the latter may be inapplicable on account of drawbacks inherent to its use. Nor is this subject in any way connected with the Holly system of water works. That, too, is distinct. It may be wise, or it may be unwise; but the arguments for or against it in no way affect the problem of giving the Fire Department an independent supply of water, which may be done on the Holly system, or on any other.

Just as New York is discussing the question of establishing pumping works, Chicago completes her largest engine. It is capable of raising 36,000,000 gallons of water 150 feet high in twenty-four hours, and is itself of about 1,200 horse-power. The introduction of a new 36-inch main has increased the head of water in some parts of Chicago as much as twenty feet. From this we may see what effect the new pipes which have already been laid in New York may have. The water supply of the city has, in fact, received several important improvements within a few years, and if to these is added a separate fire system, the citizens of America's greatest city may look forward to comforts in the use of water from which they have long been debarred.

NEW PUBLICATIONS.

CHEMICAL PHENOMENA OF IRON SMELTING. *An Experimental and Practical Examination of the Circumstances which Determine the Capacity of the Blast Furnace, the Temperature of the Air, and the Proper Condition of the Material to be Operated upon.* By I. LOWTHIAN BELL. New York, D. VAN NOSTRAND.

This is the book, concerning which Mr. ABRAM S. HEWITT, himself distinguished as an iron master and a writer on the manufacture of iron, eloquently said, at the May meeting of the American Institute of Mining Engineers, that the author "had made two continents his debtors." Mr. BELL has received in recognition of his brilliant contribution to the science of iron metallurgy, the honorary membership of the society above named—a distinction conferred but once before in its history—and the Presidency of the Iron and Steel Institute of Great Britain. Certainly the volume is a most remarkable one, combining as

it does in an extraordinary degree the insight of the practical operator, which distinguishes what are the critical and vital questions to be investigated, and the trained skill of the scientific student, which controls the methods of investigation. No original work has appeared in the English language upon this subject, which has produced a more immediate and profound impression, or evoked more general admiration and gratitude. It is true, that some of Mr. BELL's conclusions have been disputed in England and in this country—particularly those which concern the action of carbonic oxide in the blast furnace, and the relation existing between the percentages of carbon and graphite in pig-iron and its physical characters. But his thorough and ingenious researches have compelled universal respect, if not unanimous assent; and no discussion now takes place in England or America concerning the phenomena of iron-smelting, in which Mr. BELL's opinions are not admitted as weighty evidence. Nor can any iron master who aspires to understand and control the conditions of his business afford to omit the careful and repeated study of this book. We have already published extensive comments on various portions of it. It must suffice on this occasion, to state briefly the contents and scope of the work, in justification of the opinion we have expressed as to its importance.

This book consists chiefly of a series of papers prepared at different times, and containing the results of prolonged experiments. The subjects of these papers were so chosen, however, that when combined, they constitute a complete and logically connected treatise. Beginning with the subject of the chemical change which forms the basis of the iron-smelting process—namely, the reduction of the oxides of iron by means of carbon, Mr. BELL discusses the formation, behavior and action upon iron oxide and metallic iron of carbonic oxide, carbonic acid, and a mixture of the two. Then the effect of the blast-furnace gases is considered; and the conditions obtaining in every part of the blast-furnace are investigated. The dissociation of carbonic oxide, the deposition of carbon, the presence and influence of hydrogen, ammonia, hydrocarbons, alkaline metals, cyanides, etc., in the blast furnace, are then discussed.

Passing to the second great element of the problem, Mr. BELL deals with the profoundly important questions of the quantity, origin, effect, production and loss of heat in the blast-furnace; and having thus laid the broad foundation of principles, is ready to inquire minutely into some of the perplexing details of the phenomena. The capacity of the furnace as related to the process going on within it; the progressive changes of the minerals in the descending charge; the behavior of phosphorus and sulphur in the blast-furnace; the theory of the hot blast, and its effect on the quality of the iron—and many other points intimately connected with successful practice, are investigated.

A crowning merit of the book is the absence of dogmatism, which, in science, we conceive to consist in announcing results and conclusions without communicating the methods and steps by which they have been reached. Mr. BELL has conducted between eight hundred and nine hundred experiments, to elucidate his subject; and every statement of his opinions is backed by the record of his demonstration. Hence the great interest which his work has excited. On both sides of the ocean, intelligent metallurgists are busy in repeating his experiments, partly to verify his results, partly to discover whether his deductions are of local or of universal application. The book is not only instructing, but deeply stimulating and inspiring the ironmasters of two nations; and when we reflect how many of them may thus be roused to independent investigations, under the favorable conditions of daily practice and abundant means, and how fruitful have been the labors of Mr. I. LOWTHIAN BELL, we cannot but feel that a surprising harvest of knowledge will spring from the seeds which are wafted everywhere out of his well-cultivated field.

THE POPULAR SCIENCE MONTHLY.

We have received from D. APPLETON & Co. the first volume of this wonderfully interesting magazine, embracing the numbers from May to October inclusive. We know of no better periodical of the kind; and certainly there is none which so admirably serves the purpose of a busy worker in any one line of science and industry, who is at the same time anxious to keep in a general way *au courant* with progress in other departments of thought. One cannot afford to take all the journals of America and Europe, nor even to purchase all the new text-books or new and revised editions of the old ones. It is highly convenient to have at hand a magazine like this, which allows no new achievement of scientific discovery, and no new phase of thought to go long unnoticed.

The December number of the MONTHLY, by the way, is on our table, with an inviting list of contents. We notice that Dr. HOWARD CROSBY, chancellor of the New York University, receives a severe but deserved blow in the republication of his introduction to the American edition of LEIFCHILD's *Great Problem*. In that introduction, the Reverend Doctor betrays so startling an ignorance of Darwinism and Huxleyism, and of the contents of the work he introduces, that every republication of his hasty and crude performance must be a new mortification to his friends, if not to him. Fancy the Chancellor of a University charging "the modern Huxleys" with holding that the firmament is made of protoplasm!

New Steel Works.

For some days past there have been rumors current as to the establishment of a new steel works in this city for the manufacture of steel by the Bessemer process. The negotiations, we understand, which have been in progress for some time, looking to the procurement of a site, have been closed within a day or two, and it is now known that the new works are to be located at McKinney's station, on the Pennsylvania Railroad, adjoining the east line of the borough of Braddock. The company, consisting of Messrs. WILLIAM COLEMAN, THOMAS and ANDREW CARNAGIE, and others of this city, together with several capitalists from the east, have contracted to purchase one hundred acres of land from the MCKINNEY brothers, at the point designated, to be used as a site for the works. The situation is one of the most eligible in the country for manufacturing purposes. It is between ten and eleven miles from the Union depot, and about four miles east of the city line. It extends from the Pennsylvania Railroad, southwardly, to the Monongahela river, having a good river front. The Pittsburg and Connellsville Railroad runs through the property, dividing it about midway between the Pennsylvania Railroad and the river. It is level land, being what is known as "river bottom." The price agreed upon between the parties is $2,500 per acre for that portion between the two railroads, and a less amount for that lying between the Connellsville road and the river—the whole purchase footing up $200,000. The price at which the land was purchased is regarded as very low, but the Messrs. MCKINNEY, have a large tract left, which will be greatly enhanced in value by the erection of the works. This fact was taken into account when the price was fixed. Another important fact in connection with the location is, that the bridge over the Monongahela, which is to connect the Pittsburg, Cincinnati and St. Louis Railroad line with the Pennsylvania Central, is to be built at this point. The works will therefore have extraordinary facilities for the receipt of raw materials, coal, coke, etc., and the shipment of their manufactured products. The best of coal can be received directly from the mines by water, and rails and other manufactured articles can be sent to market by the same channel, as well as by the Pennsylvania road and its numerous western connections. There will also be a connection with the Pittsburg, Virginia and Charlestown road, upon the completion of the railroad bridge already mentioned. We understand that the capital employed will reach $1,000,000, and that the works will be complete in every detail. Operations will be commenced at an early day, and the work will be prosecuted with vigor.

The completion of these works will form a new era in the manufacture of steel in Pittsburg—a branch of industry which has been rapidly developed here during the past few years, and which bids fair to add largely to our wealth and prosperity.

The prices of real estate in the neighborhood of the site of the new works have been greatly stimulated, in view of the fact that a community of no inconsiderable size will grow up there.—*Pittsburg Commercial.*

British Mining Returns for 1871.

General Summary of the Returns of the Mineral Produce of the United Kingdom received by the Mining Record Office for 1871:—

No. of Mines.	Mineral.	Quantities. Tons.	Cwts.	Value. £
2,760	Coal.....	117,352,028	0	35,205,608
210	Iron Ore*.....	16,334,888	14	7,670,572
122	Copper ore....	97,129	0	387,118
145	Tin ore.....	16,272	0	1,030,834
241	Lead ore.....	93,965	17	1,155,770
47	Zinc ore.....	17,736	10	56,330
33†	Iron pyrites (sulphur ores).	61,973	0	64,987
1	Silver ore.....	5	10	421
16	Arsenic ‡.....	4,147	15	15,519
9	Gossans, ochres, &c.....	697	5	1,396
1	Wolfram and Tungstate of soda.....	20	0	228
1	Nickel.....	2	0	98
1	Bismuth.....		2	14
2	Fluor spar....	51	10	26
4	Manganese....	5,548	1	22,958
1	Cobalt ore....	3	0	120
	Barytes.....	5,512	8	3,539
	Clays, fine and fire (partly estimated).....	1,255,000	0	475,000
	Earthy minerals (estimated).....	—		600,000
	Salt.....	1,505,725	0	752,862
	Coprolites (estimated).....	36,500	0	51,000

Total value of the minerals produced in the United Kingdom in 1871:— £47,494,400

Metals obtained from the Ores enumerated, &c., in the United Kingdom in 1871:—

Description of Metal.	Quantities.		Value. £
Pig Iron.....	tons	6,627,179 ..	16,667,947
Copper.....	"	6,280 ..	475,143
Tin.....	"	10,900 ..	1,498,750
Lead.....	"	69,056 ..	1,251,815
Silver.....	ounces	761,490 ..	190,372
Zinc.....	tons	4,966 ..	92,743
Other metals (estimated.....		—	3,000

Total value of the metals produced from the ores of the United Kingdom in 1871:—..... £20,179,770

Total value of the metals produced which are not smelted:—Coal and other minerals raised in 1871:

Metals, value of, as above.....	20,179,770
Coal, " " "	35,205,608
Minerals, earthy, &c.	1,936,515
Total value.....	57,321,893

In this gross sum of 57 millions sterling, neither building stones, lime, slates, nor common clay, nor brick earths are included.

Mr. HUNT, in his preface, remarks that "This issue of the 'Mineral Statistics of the United Kingdom' will probably be the last obtained under the system of voluntary contribution, which has been the rule since 1848, when the attempt was first made to collect returns of our mineral produce. By two acts

* It has not been possible, in every case, to determine whether the return of iron ore has been for *calcined* or *uncalcined* ores. The actual production of "raw ore" will, probably, be in excess of this quantity. Estimating the quantity of pig iron made at 2¾ tons of ore for each ton of iron, and deducting the foreign ore, "burnt ore," and "cinder" used, the quantity will be about, or slightly above, 17,000,000.

of Parliament entitled respectively—(*a*) 'The Coal Mines Regulation Act, 1872,' (*b*) 'The Metalliferous Mines Regulation Act, 1872,' the return of coal and other minerals is rendered compulsory. We must, therefore, hope that the increased correctness, which should be ensured by these enactments, will render the 'mineral statistics'—which have already obtained from all who are interested in them the marks of high approval—of yet higher value to the miner, metallurgist, the mineral dealer, and the public generally than they have hitherto been.

Engineering and Mechanical Notes.

A steamship designed for the special work of laying submarine cables, is to be built for a cable manufacturing company in England. It will be able to take on board 3000—4000 miles of cable, but will be smaller than the *Great Eastern* and will cost much less to run than that great vessel. The difference indeed is such that the new ship is expected to effect an important saving in the cost of submarine lines. But what is to become of BRUNEL'S great master-piece? Hitherto the existence of the *Great Eastern* at the time when the new industry of cable laying began, has been looked upon as one of the happiest providences known in history, and it is very doubtful whether cable laying would have been so successful without it. We shall look with curiosity to the future of the splendid but not over useful ship.

MESSRS. FOSTER & STRUTHERS are erecting works at Glenwood, on the Pittsburgh and Connellsville Railroad, for the manufacture of steel directly from the ore. Six furnaces are completed for roasting the ore, and one five ton Siemens furnace is expected to be completed in a few weeks.

The Wilmington, Delaware, *Gazette* says: A company whose headquarters appear to be in New York, and who seem to be solid, intelligent, business-like men, are making a survey and locating a double track narrow gauge road from that city to Baltimore, with a line branching off at Oxford, Pa., westward through Lancaster, York, Adams and other counties, to the bituminous coal fields. Preliminary surveys have been made and the location is going forward on most of the lines, and the right of way is being obtained in some sections. This much in Pennsylvania, while in Maryland, from the Susquehanna river opposite the mouth of the Octoraro, to Baltimore, the location has been made and in some places the contractors are reported at the work of grading.

We are glad to see that the Government has not ceased its efforts to obtain, if possible, a practicable canal route across the Isthmus of Darien. Two expeditions will start in a short time, Commander SELFRIDGE going to the Darien route, and Commander LULL to the Nicaraguan route. The former of these officers thinks that one of the lines he has already surveyed is entirely practicable and now seeks to find a cheaper one.

The suspension bridge known as the Pont de Constantine, at Paris, erected in 1838, to connect the island of Saint-Louis with the Quai Saint-Bernard, has just fallen into the Seine. It was suspended by two cables of iron wire, to which were attached long rods, supporting the planks. These had been gradually worn away by the continual oscillations caused by the tread of passengers, and the iron had become rusty, so that it had been undergoing repairs for nearly a month past.

The Danks' furnace is meeting with increasing success on the Continent. It is being introduced at the Motala Iron Works in Sweden; at the works of M. de Wendal, et Hayange, Alsace-Lorraine; and at the Selessin works, near Liege.

The Marquis of Bute is preparing for the Philadelphia Centennial Exhibition of 1873 a complete assortment of metals and ores from Wales, the county of Durham, and the entire basin of South Wales, including Monmouthshire. If the reports concerning the Marquis of Bute's purchases of mineral property in this country are true, he will be able, before long, to make a very interesting collection of American ores for display at one of the English Exhibitions and make it from his own mines.

Mining Under Pressure.

Mr. JOHN A. R. NEWLANDS sends to the *Chemical News* a plan for overcoming the evils attendant upon "fiery" mines, by raising the pressure in the mine. He says:

"Diminished atmospheric pressure is frequently followed by the escape of fire-damp into the workings of a colliery. To obviate the risk incurred by such barometrical changes, I propose that artificial means should be adopted, so as to maintain the atmospheric pressure within a given mine always at one and the same level, and also, if desired, to work under a somewhat increased atmospheric pressure. Taking the case of a mine having a downcast and an upward shaft, the mouth of each of these should be covered over by an air-tight chamber, capable of withstanding a moderate pressure either from within or without. This air-tight chamber might be conveniently constructed of sheet-iron, provided with thick glass windows; it should also be made sufficiently large to admit of all the usual operations at the pit's mouth being conducted within it. The shaft of the engine used for raising coal would pass through the sides of this air-tight chamber, so as to move the necessary hoisting apparatus within. Connected with this air-tight chamber an air-tight room should be constructed, provided with two sliding doors, the inner door separating it from the air-tight chamber, and the outer door preventing contact with the external atmosphere. It will be seen at a glance that when the outer door of the room is shut, and the inner open, the room becomes part and parcel of the air-tight chamber, so that any truck laden with coal might be run from the air-tight chamber into the room, and then (by closing the inner door of the room and opening the outer) on to the ground surrounding the pit's mouth, without sensibly altering the pressure within the pit itself.

"To produce the requisite current of air for ventilating the pit, the air-tight chamber over the downcast shaft should be connected with powerful air-pumps, worked by steam, so that a continuous current of fresh air might be forced through all the workings of the pit before finally escaping through a pressure-valve from the air-tight chamber over the upcast shaft. Any required degree of ventilation, or of increased atmospheric pressure, could thus be produced within the pit. As no fire would be wanted in the upcast shaft, it would be available for hoisting coal, &c. The air supplied to the mine might, if required, be easily cooled, by compressing it in cylinders surrounded with cold water before allowing it to pass into the pit, and thus the temperature of the pit might be reduced to any extent. The air issuing from the pit should be chemically tested at stated hours, and whenever the fire-damp appeared to be increasing, the men and horses should be brought up, and the air-pumps should be employed in drawing air out of the mine, so as to diminish the pressure within, and thus cause any imprisoned marsh-gas to be brought out of its hiding-place. After keeping the mine under diminished pressure for some hours, a rapid current of air should be driven through the workings, and when—by testing the air passing through the escape-valve—it was found to be nearly pure, operations could be safely recommenced."

It is possible that something of this kind might be effected, though the cost of keeping a large mine closed would be very great. But if the condition of things alluded to in the latter part of Mr. NEWLANDS' suggestion—that is, the necessity of withdrawing the men—should occur with any frequency, we may be sure that this method cannot very soon come into use; for the loss and cost of such a stoppage would, in the present condition of coal mining, enforce the abandonment of any mine that required an oft-recurring cessation of work.

MINING SUMMARY.

California.

NORTH BLOOMFIELD GRAVEL MINING COMPANY.

The Nevada *Transcript* says: During the past year the North Bloomfield Gravel Mining Company have extended their enterprise until now they employ 450 men, and they expect to add considerable to this force for the purpose of extending their ditch down into Bridgeport township. The operations of this company extend from Bowman's dam to Lake City, and they have given life and energy, more or less, to the business of every mining camp within the range of their operations. They now have 150 men employed at Bowman's, and the dam will, it is expected, be completed in two weeks. Their ditch conveys water from this dam to the township of Bloomfield.

The most important work of the company now is the bed rock tunnel, which is to open the basin or channel at Bloomfield. This channel was opened to the bed rock 208 feet, and found to contain pay gravel from the surface down. The company having ascertained this determined to run a bed rock tunnel from Humbug canyon to their claims, that sufficient fall might be obtained to work to advantage. The surveys were made by Hamil ton Smith, Superintendent of the company, and the work commenced about the first of last May. We have recently passed over the line of works, and a description will be interesting to our readers. The tunnel will, when completed, be 8,000 feet in length. The mouth of the tunnel is 440 feet lower than the channel, and will, at the upper end, be about seventy-five feet lower than the gravel. A road was built by the company along the line of the tunnel, and eight hoisting works put up, numbered from one to eight inclusive, coming from the mouth of the tunnel. They are all built on the same plan, and are run by hurdy-gurdy wheels. The power is supplied from the company's reservoir, through 10,000 feet of iron pipe. The shafts are double and sunk diagonally with the line of the tunnel, in order to give the greatest possible width for working on the faces where the shafts are completed. The works are about 900 feet apart, and in all of them they are now sinking, and at the same time running the tunnel from the mouth.

No. 8 is on the rim rock of the channel, and No. 1 the nearest to the tunnel mouth. As we said before, work was commenced in May, the works completed, and much already has been accomplished. The shafts vary in depth from 178 to 195 feet, and the tunnel has been run 235 feet from the mouth. About 720 feet in the aggregate has been completed, out of a total of 1,550 that must be completed before the line for work upon the tunnel will be reached. When this is done, the tunnel will be run from both faces in each shaft, and also continue work in the tunnel. It is expected that the entire work will be completed in the Spring of 1875. This is to-day one of the most extensive mining operations on the coast, and all the work is being done systematically and thoroughly. The channel to be opened is rich, and the bed rock has only been reached for prospecting. This company deserve credit for their enterprise, and we hope that the highest anticipations of the company's managers may be more than realized.

Colorado.

GRAND ISLAND DISTRICT.

Correspondence of the Colorado *Herald*.

Middle Boulder, Col., Oct. 23, 1872.

The already famous Fourth of July lode is attracting a great deal of attention here, so much so that in company with Messrs. Arnett and Caffee, of Middle Boulder, your correspondent took a climb over the rough mountains that lay between Cariboo and the north base of Arapahoe peak, where this mine is situated, in order to lay before your readers whatever of interest could be picked up concerning this Leviathan of the mining world. The first shaft we visited was at the Discovery, where we found Mr. McGlothlin, the discoverer, at work with two men. The shaft was sunk about twenty feet, being fifteen feet wide at the top and running forty feet long across the crevice, while the same material has been brought to light for twenty feet beyond, showing the crevice to be at least sixty feet wide. On examination, I found seams of galena intermixed with zinc blende, oxides of copper and brittle silver. These seams vary in width from two to eighteen inches. An average assay from about seven feet of these seams made by Prof Livernash, gave in silver $1184 15. The gangue rock consists of a white fine grained quartz, thoroughly mixed with copper pyrites that by assay is found to carry silver at the rate of from $30 to $60 to the ton. They must have

at least fifty tons of good smelting ore on hand that has been awaiting the completion of a road from Middle Boulder to the mine. The owners confidently count on finishing this before the snow prevents, so that they can take out, at least, enough ore to show they have the most valuable silver mine in the world.

S. B. Andrews and J. P. Jameson are the fortunate owners of the first extension west on this wonderful mine. Their discovery shaft is about fifty feet from the Fourth of July territory. To speak of this would only be repeating what I have said of the Fourth of July.

The first extension east it owned by McGlothlin & Co., and the second by Dr. A. J. Mann. This last looks equally as good as at any place on the crevice. Other extensions have been struck by different parties, but time forbade our visiting them. There is no doubt but that they all have a fortune in sight if they are on the same crevice.

A. D. Breed shipped three beautiful silver bricks, coin value $2292, on Monday, from his Reduction works to A. L. Scovill & Co. New York. These shipments are becoming very frequent. The mill is run without intermission by Mr. Dawley, an experienced Nevada mill-man, whose results are quite satisfactory to the owner.

Building at Middle Boulder has taken a fresh start and a dozen buildings are approaching completion, among them a store house by Mr. Newby, who willl soon move his busines from Cardinal to this point.

Hetzer & McKenzie's fifteen stamp mill is kept steadily running on quartz from the Trojan dump pile, yielding from four to six ounces of gold per cord. Duncan & Co. are said to have discovered a very rich lode near the head of Four Mile Creek.

Nevada.

EUREKA CONSOLIDATED MINE.

An adjourned meeting of the shareholders of the Eureka Cons. M. Co., was held on the 10th inst., when it was expected that a new Board of Trustees would be elected instead of the present one. A number of the shareholders desired this change in management, believing that the Trustees were not carrying on affairs to the best interests of the company. The furnaces and mines of the corporation have been under way for a long time and with apparent success, while for more than a year no dividends have been paid. The principal cause of complaint appeared to be that large quantities of charcoal had been purchased at 32 cents per bushel, when it was selling at 28 cents, and cord-wood bought at $8 per cord, when it could be obtained for $6. There was a week or so ago about 600,000 bushels of charcoal on hand at the furnaces, which would have been sufficient to run them through the season of bad roads, and the roads in that locality will probably be good for two months to come. The shareholders see no reason why a large expenditure should be made for charcoal when there is no immediate necessity for it, and there is a large stock on hand, especially when a price above the market value is paid for it. They think it about time to see a dividend.

Charcoal too, as is well known, deteriorates with time, and if the quantity on hand was as large as represented, and an exhorbitant price was paid, the shareholders certainly have just cause of complaint. There is no use in a dividend being tied up in a lot of charcoal for six months or a year. The failure on the part of this company to pay dividends has been a serious drawback to Eureka District, it being the representative one. At the meeting in question the committee appointed to nominate Trustees, put in a ticket, but most of the old Board were re-elected, as follows: W. W. Lawson, (re-elected), Thomas Bell, (re-elected), Wm. Thompson, (re-elected), Capt. W. H. Osgood and James Findla. The two latter took the places of George Hearst and Lloyd Tevis. We are glad to see the shareholders of mining companies standing up for their rights when they think they are being abused. A few wholesome lessons will be remembered, and will serve to remedy many evils in the future. In this instance the old Board was re-elected, it is true, but they will no doubt have hereafter, more consideration for the wishes of stockholders. If more shareholders would take an interest in the *mining* department of their companies, and not so much in the fluctuations of the stock, a great improvement would be made, and more care taken by trustees and officers in their management.

The following statement is condensed from the report of the Secretary:

RECEIPTS.

Proceeds 3,019 tons base bullion refined, including 1,430 tons last year's product	$1,159,509
Approximate value 1,981 tons base bullion at refinery works, Newark, New Jersey, and en route	641,160
Exchange on coin drafts	3,526
Reclamation for over charges on freight	1,273
Miscellaneous	1,062
Total	$1,806,530

DISBURSEMENTS.

For construction and improvements	$ 54,959
Mine account	251,803
Smelting account	680,330
General expenses, Eureka	41,299
Expenses at San Francisco	11,001
Interest, etc.,	23,126
Freight and refining, etc., on bullion	259,101
Office fixtures	75
Dividend No. 6 paid to stockholders	50,000
Real estate, Eureka	1,500
House for use of assayer	1,200
Wood ranch	719
Mining property	2,023
Bills payable	25,000
Book accounts	683
Total disbursements	$1,402,819
Balance value of bullion on hand Sept. 30, '72	403,711
Total	$1,806,530

RESOURCES.

1,981 tons base bullion	$ 641,160
Charcoal on hand	150,666
Supplies at Eureka	5,116
A. M. Ellsworth, Superintendent	1,714
Total	$ 798,666

LIABILITIES.

Drafts against bullion shipments	$ 328,589
Overdrafts	169,328
Superintendent's drafts not presented	9,569
Book accounts not due	8,375
Bills payable	75,000
Total liabilities	$ 590,861
Net resources	207,795
Total	$798,656

Lees & Waller, at New York, advise by letter that the amount standing to the Company's debt on the 1st day of October, 1872, was $113,586. The product of the mine for the year was 3,570 tons base bullion, of which 1,589 tons have been refined, yielding $608,340, leaving a balance on hand of 1,981 tons at refinery works and en route, valued at $641,160, making the total yield for the year $1,259,500, or $153,320 less than the disbursements. The average cost of extracting the ore for the year has been $7.84, while the cost of smelting has been $18.33 per ton.—*Scientific and Mining Press.*

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, *as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is doubly valuable as a permanent means of keeping an advertisement before the public. It is the Organ of the* AMERICAN INSTITUTE OF MINING ENGINEERS, *and is regularly received and read* BY ALL THE MEMBERS AND ASSOCIATES *of that large and powerful society,* THE ONLY ONE OF THE KIND IN THIS COUNTRY. *It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country, and presents the very best means of reaching that very important class of men.*

Rates of Advertising.

The rates of advertising, compared with those of other weekly industrial publications, are very low, especially when the class of consumers among which its large circulation is almost entirely confined, is taken into consideration.

Back Page ..... 40 cents a line.
Inside Pages ..... 25 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

SALE OF VALUABLE

MINING PROPERTY.

BY Virtue of a decree of the Court, we will sell for cash, at the Forge, in Franklinsville, Randolph County, N. C., on the 20th of December, 1872, the following valuable property:

One undivided half of 15 acres, known as the Hopper's Ford Mill site.

One other track of 30 acres, known as the Iron Ore Hill, on which is an inexhaustible bed of superior Iron Ore.

One tract of six acres, on which are all the buildings, forge, &c.

Also 50 acres, valuable for minerals, adjoining the above.

Also, some personal property—mining implements, large whim rope, &c., &c.

Nov. 12:6t — A. G. HORNEY, W. F. BOWMAN, } Com'rs.

WOOD ENGRAVING

EXECUTED AT THE OFFICE OF

The Engineering and Mining Journal

No. 37 PARK ROW, NEW YORK CITY.

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FURNACES, RANGES, STOVES.

SANFORD'S PATENT CHALLENGE HOT AIR FURNACES,

STATIONARY, or PORTABLE, very powerful and economical, always satisfactory;

New York Fire Place Heater,

warming several rooms with one fire;

CHALLENGE KITCHEN RANGES,

a variety of Choice PORTABLE RANGES, and first-class COOKING STOVES; also the famous

BEACON LIGHT BASE BURNERS, SANFORD'S MAMMOTH, or GLOBE HEATERS,

and other heating stoves, made by

THE NATIONAL STOVE WORKS,

Nov. 19:6t — 239 & 241 Water street, New York.

SUPERIOR RAIL MILL.—CAPACITY: 1,000 TONS PER WEEK.

Harbaugh, Mathias and Owens,

Manufacturers of

RAILROAD IRON,

Office, corner Fifth Avenue and Smithfield Street, Pittsburgh.

Our central location enables us to draw from both sides of the Allegheny Mountains Metals and Ores best adapted for making a No. 1 Rail, and together with our Improved Machinery, are a sufficient guarantee of our ability to produce Rails of a quality unsurpassed for durability and strength, by any foreign or domestic manufacture.

New Patterns, of any desirable weight, made to order on Short Notice.

We respectfully solicit orders for New Rails, or Re-rolling. June 25.1y

UNITED ROYAL SMELTING WORKS

OF THE

KINGDOMS OF PRUSSIA AND SAXONY.

GENERAL AGENCY—R. J. ROBERTSON, HAMBURG, GERMANY,

Whose representative for the United States,

H. ROBERTSON, 149 BROADWAY, NEW YORK,

Is ready to receive consignments of

ORE and all kinds of FURNACE STUFF

For the above-named Works.

Full particulars given on application.

JOHN J. ENDRES,

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MANUFACTURER OF MACHINERY FOR MINING AND SMELTING PURPOSES.

SPECIALITY:

Patent Ore and Coal Crushing and Washing Machines.

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Nov. 26:3m

108th Auction Sale.

75,000

TONS SCRANTON COAL.

On WEDNESDAY, NOV. 27th, 1872.

NEW YORK, November 20, 1872.

The Delaware, Lackawanna and Western Railroad Company will sell, by MESSRS. JOHN H. DRAPER & CO., Auctioneers, at the Company's Sales Room, 26 EXCHANGE PLACE, corner of William Street, NEW YORK, on WEDNESDAY, November 27, at 12 o'clock, noon,

75,000 TONS

OF

COAL, FROM THE LACKAWANNA REGIONS,

of the usual sizes, deliverable at their Depot, Elizabethport, N. J., during the month of December, 1872.

The sale will be positive; each lot put up will be sold to the highest bidder; no bids, in any form whatever, being made for account of, or on behalf of the Company. The conditions will be fully made known at the time of sale.

TERMS: FIFTY CENTS PER TON, payable in current funds, on the day of sale, and the balance, within ten days thereafter, if required, at the office of the Company.

SAMUEL SLOAN, President.

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In order to benefit those who are in need of looking up information on subjects of industrial interest, we offer a complete set of THE MANUFACTURER AND BUILDER for the low price of $5. That means any one who sends us a Post office Order of $5 will at once receive the volumes for 1869, 1870, and 1871, all complete, also the first half of 1872, and be considered a subscriber for the rest of the present year, so that in December next he will be in possession of four volumes complete. As they contain over 1300 pages printed matter, illustrated with more than 1000 fine wood-cuts, and in the combined index more than 5000 words of reference, they form not only a desirable addition to any library, but for those not possessing many books they are a most valuable library in themselves, containing more modern information than it is possible they ever could obtain in any other way for that amount of money.

This offer remains open only as long as the limited supply of the back volumes, which we have now on hand, will hold out,

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We have largely increased our facilities for promptly accommodating our customers. All orders promptly filled.

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ERASTUS CORNING, JR., CHESTER GRISWOLD.

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Bessemer Steel Rails, Axles, Tyres, Shafting Plates and Steel Forgings,

OF ALL DESCRIPTIONS.

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May 17:1y

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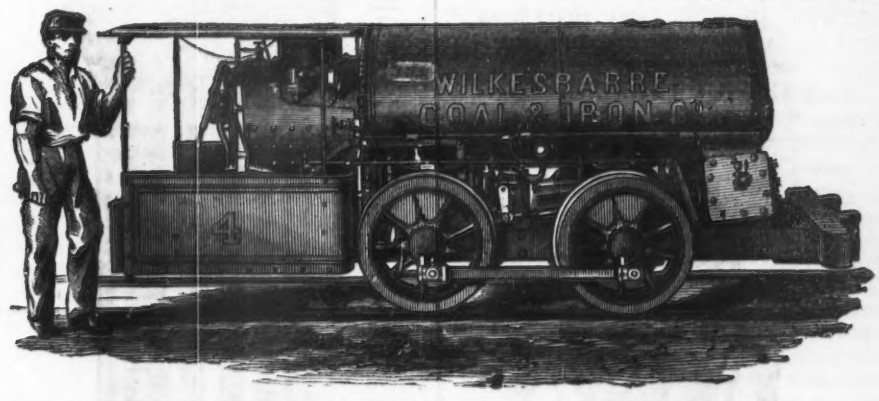
GORDON MONGES, Treasurer. B. C. WEBSTER, President

WORKS, BETHLEHEM, PA OFFICE, 333 Walnut Street, Philadelphia.

JOHN JEWETT & SONS, AGENTS, 182 FRONT STREET, NEW YORK.

OXIDE OF ZINC, SPELTER, SHEET ZINC.

Jun28:1y SPIEGELEISEN CINDER FOR BLAST FURNACES.



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Feb:7-1y:eow M. BAIRD & CO., Baldwin Locomotive Works, Philadelphia.

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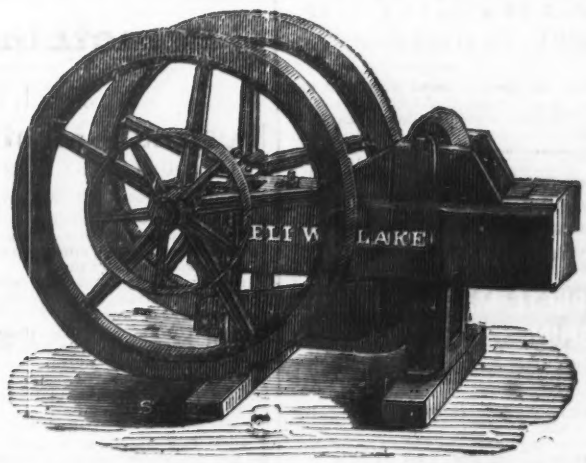

The office of this Machine is to break Ores and Minerals of every kind into small fragments, preparatory to their further comminution by other machinery.

This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is everywhere received with great and increasing favor as a labor-saving machine of the first order.

Illustrated circulars, fully describing the machine, with ample testimonials to its efficiency and utility, will be furnished on application, by letter to the undersigned.

☞ The Patents obtained for this machine in the United States and in England having been fully sustained by the courts, after well contested suits in both countries, all persons are hereby cautioned not to violate them; and they are informed that every machine now in use or offered for sale, not made by us, in which the ores are crushed between upright convergent faces or jaws actuated by a revolving shaft and fly-wheel, are made and used in violation of our patent.

Mch. 14-1y. **BLAKE BROTHERS, New Haven, Conn.**

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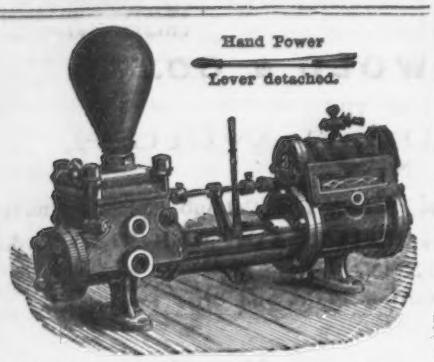

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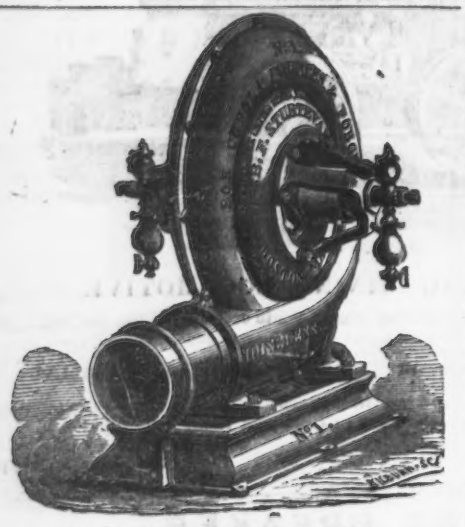

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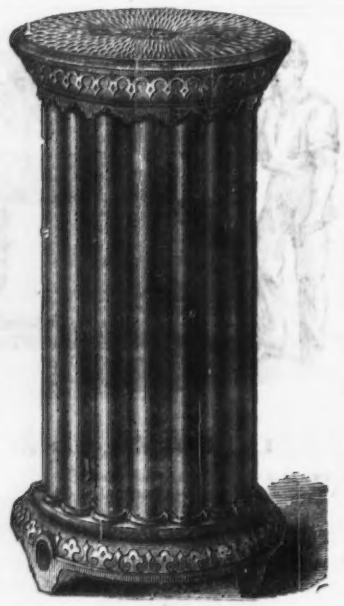

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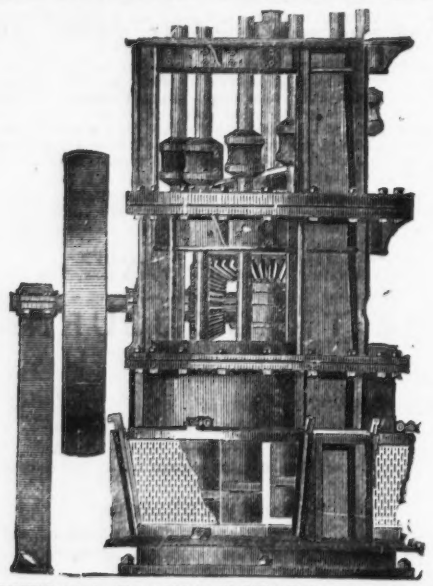

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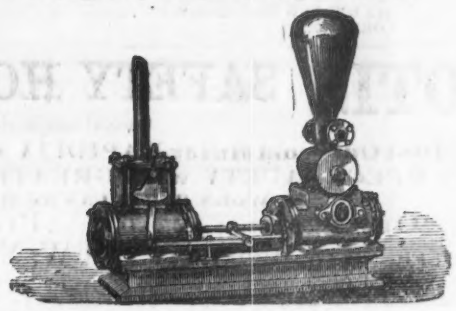

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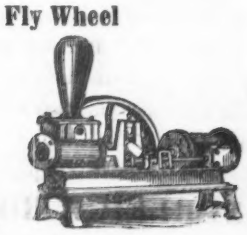

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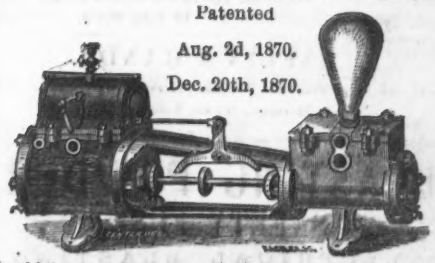

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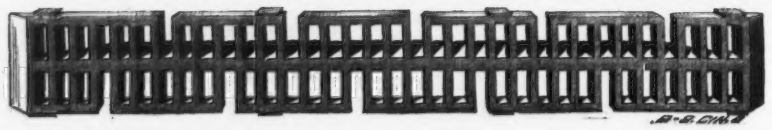

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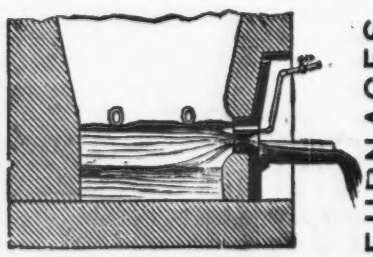

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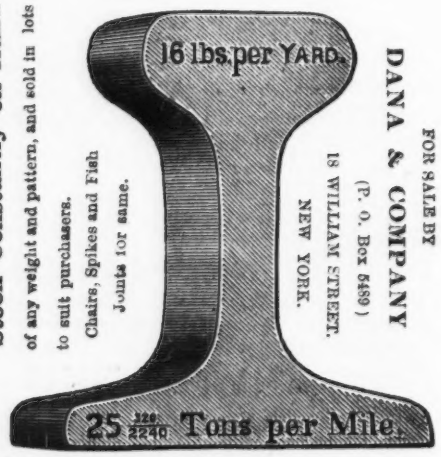

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